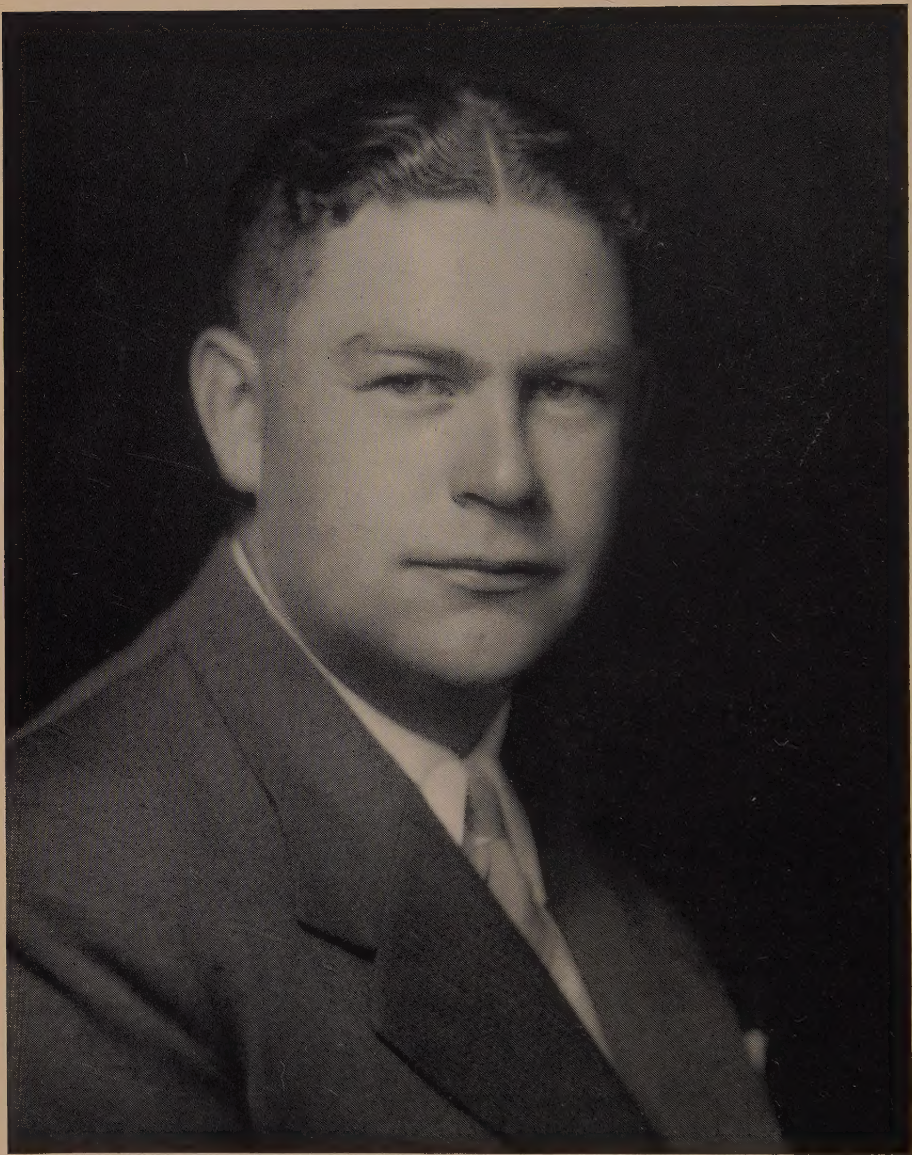
.. 8, NO. 54 SEPTEMBER 1956

THE POLAR RECORD

A Journal of Arctic and Antarctic Exploration and Research

Issued by the Scott Polar Research Institute, Cambridge



ESKE BRUN

THE POLAR RECORD

Vol. 8 September, 1956 No. 54

CONTENTS

FRONTISPIECE . . . . Eske Brun

FOREWORD . . . . *page* 220

ARTICLES:

The Soviet drifting station SP-3, 1954–55. By A. F. Treshnikov . 222

Air operations of the Norwegian–British–Swedish Antarctic Expedition in 1952. By Kapten Reinhold von Essen 230

Air survey of the Falkland Islands Dependencies, 1955–56. By P. G. Mott 237

Metal buildings at the French antarctic base on Île des Pétrels. By Bertrand Imbert 246

FIELD WORK:

Trans-Arctic commercial flights, 1952, 1953 and 1954 . . . 253

British university expeditions, 1955 253

Fisheries research in Hudson Bay: *Calanus* expeditions, 1955 . . 254

U.S. Operation "Southwind" 1955 255

South African expedition to Bouvetøya, 1955 256

Australian National Antarctic Research Expedition, 1955–56 . . 258

The Falkland Islands Dependencies Survey, 1954–55 . . . 260

Trans-Antarctic Expedition, 1955–56 264

NOTES:

The use of dehydrated foods in field conditions 268

The Greenland bird-ringing scheme 270

Experimental reindeer husbandry in west Greenland . . . 272

Norwegian topographical maps of Svalbard 273

Search and rescue device "SARAH" 276

McGill University sub-Arctic Research Laboratory, Knob Lake, Quebec 277

Soviet polar stations, 1956 279

OBITUARY 279

RECENT POLAR LITERATURE 280

ERRATA 302

FOREWORD

The frontispiece of this issue is a photograph of Eske Brun, Departement-schefen in Ministeriet for Grønland. After leaving university in Copenhage[n] he served for three years in the Ministry of Finance before entering Grønland[s] Styrelse (now Ministeriet for Grønland). He was acting governor of Greenlan[d] from 1932 to 1936, Governor from 1939 to 1946, vice-Director of the Grønlan[d] Administration from 1946 to 1949, and has served in his present positio[n] since 1949.

A most welcome development of the last few months has been the renewa[l] of contact between this Institute and the Arctic Institute (Arkticheski[y] Nauchno-Issledovatel'skiy Institut) in Leningrad. This has come about as [a] result of an exchange of visits, proposed by us a year or so ago to our Sovie[t] colleagues.

We welcomed to this country Mr A. F. Treshnikov, a Deputy Director of th[e] Arctic Institute, and Professor I. V. Maksimov, a geophysicist who has lon[g] worked on their staff. Between 18 and 28 April we were able to show ou[r] visitors not only the Institute and the University, but a number of scientifi[c] institutions of interest to them in London and elsewhere. Mr Treshniko[v,] who was the leader of the Soviet drifting station SP-3 in the Arctic Ocea[n] from April 1954 to April 1955, lectured at the Institute on the experiences o[f] this expedition and its scientific results, and a shortened version of this lectur[e] appears in this issue.

The return visit by Dr B. B. Roberts and Dr T. E. Armstrong took plac[e] between 28 May and 9 June. They were hospitably received by the Arcti[c] Institute, which arranged for them to spend some time in the Institute itsel[f] and also to visit a number of institutions concerned with arctic work i[n] Leningrad and Moscow. Dr Armstrong lectured at the Arctic Institute and a[t] Moscow University on the work of the Scott Polar Research Institute an[d] current British antarctic activity. Many publications were presented to th[is] Institute.

Perhaps the most valuable aspect of such visits is the opportunity the[y] afford for personal contact between specialists, and it is hoped that th[is] opportunity, which was used to the full, will lead to a free interchange o[f] ideas. Exchanges of literature have been arranged between this Institut[e] and the Arctic Institute, also with other institutions including the V.A[.] Obruchev Institute of Permafrost Studies (Institut Merzlotovedeniya ime[ni] V.A. Obrucheva) and the Research Institute of the Agriculture of the Fa[r] North (Nauchno-Issledovatel'skiy Institut Sel'skogo Khozyaystva Krayneg[o] Severa).

The Colonial Office has made a contract with Birmingham University t[o] finance the work of a research organization within the Department of Geolog[y] of the University. This organization will supervise the geological work of th[e] Falkland Islands Dependencies Survey (F.I.D.S.) under the general directio[n]

of Professor F. W. Shottan. Dr R. J. Adie, who served as geologist at Hope Bay from 1947 to 1948, and at Stonington Island from 1948 to 1950, will co-ordinate the work as Senior Research Fellow. The full facilities of the Department of Geology will be available. Geologists will receive training in the particular problems and techniques of the area before a tour of service at a F.I.D.S. station, and research fellowships will enable them to prepare their results for publication when they return. Research fellowships will also be available from time to time for special work on the petrology and palaeontology of existing collections. The object of the work is the preparation of a geological map, and the evaluation of economic resources in the area. The contract is for an initial period of three and a quarter years, and is the first of its kind to be made in Great Britain. L.M.F.

July 1956

Illustrated Ice Glossary

In the introduction to the illustrated ice glossary printed in the *Polar Record*, Vol. 8, No. 52, 1956, p. 4–12, it was stated that there might be some small differences "between this glossary and the World Meteorological Organization's nomenclature, which is not yet published but will probably appear soon".

The W.M.O. nomenclature was in fact adopted officially for international use and was issued shortly after this glossary had gone to press, and it is now possible to compare the two. *There is in fact no significant contradiction, so that users need have no fear that by relying upon this illustrated glossary they are running counter to the agreed international usage of the W.M.O. nomenclature.* Selection of terms is different in the two cases: this glossary has not included all the W.M.O. terms, and has added certain others (e.g. for land features) where the W.M.O. had no term to cover the particular concept. Of the fifty-four concepts common to both lists, the only discrepancies are between "frazil ice" (*Polar Record*) and "ice crystals/frazil crystals" (W.M.O.) and between "sludge" (*Polar Record*) and "slush or sludge" (W.M.O.). The definition of the terms, although not in every case word for word the same, are so close as to leave no room for ambiguity. T.E.A.
B.B.R.

THE SOVIET DRIFTING STATION SP-3, 1954–55

BY A. F. TRESHNIKOV[1]

[This paper is an abbreviated version of a lecture delivered at the Scott Polar Research Institute on 21 April 1956.]

In the early years of Soviet power, expeditions to the Barents and Kara Seas were organized, and this laid the foundations of navigation between the European part of the Soviet Union and the Siberian rivers Ob' and Yenisey. In the course of these voyages great quantities of goods were carried across the Arctic seas, which were to become important in the country's economy.

Intensive investigation of the Arctic began in the 1930's. In 1932 the icebreaker *Sibiryakov* completed a voyage along the north coast of Siberia from one end of the Northern Sea Route to the other. After this voyage the government set up a special organization—the Chief Administration of the Northern Sea Route [Glavsevmorput']—which was given the task of studying the Northern Sea Route and organizing traffic both with the object of supplying Siberia and of securing a link between the European part of the Soviet Union and the Far East. Every year the turnover along the Northern Sea Route increases. A great quantity of minerals and raw materials is exported from Siberia. Large development projects and constructional works have been inaugurated in the most northerly parts of Siberia. Every summer the Arctic seas are teeming with hundreds of ships carrying thousands of tons of goods.

These successes in arctic navigation were possible through planned scientific study of the nature of the Arctic. On the mainland and on the islands polar stations were set up, where accurate systematic observations are made of the weather, and of the hydrology and ice conditions of the arctic seas. An ice and weather service was established. This informs captains of ships sailing in arctic waters about the ice and weather on their route.

However, there were no observations from the great expanse between Siberia and North America which is filled with floating ice. The absence of any observations complicated the analysis of processes in the atmosphere and in the sea and ice. That is why in the 1930's there arose among Soviet polar explorers the idea of organizing the long-term research stations on the floating ice of the central Arctic.

On 21 May 1937—about 40 years after the drift of the *Fram*—the station occupied by Papanin and his party was placed upon the ice near the North Pole; this is now called drifting station SP-1, meaning North Pole 1. This station drifted from the Pole to lat. 71° N., in the Greenland Sea, and after 9 months was taken off the ice by an icebreaker. The heroic work of the four valiant polar explorers Papanin, Shirshov, Fedorov and Krenkel' had brilliant

[1] Deputy Director in charge of research of the Arctic Institute [Arkticheskiy Nauchno-Issledovatel'skiy Institut], Leningrad.

scientific results. Along the whole course of drift depths were measured; there was study of the movement and composition of the water masses at various depths, and there were systematic observations on the weather and magnetic phenomena.

This drifting station established that in the central Arctic meteorological processes developed just as intensively as in more southerly latitudes. Up to that time it had been thought that over the central arctic there was a constant layer of cold air with high pressure. In fact it appeared that in the spring and summer it is reached by deep depressions. The meteorological reports sent out from this station showed that the observations had great significance for improving the quality of weather forecasts.

A year after the start of the drifting station the icebreaking ship *Georgiy Sedov* started drifting through the south-western part of the central polar basin along a course roughly parallel to that of the *Fram*. The observers aboard the *Sedov* also contributed interesting and important material on the drift of ice, the weather, and magnetic phenomena in the central Arctic. In sum, thanks to all these expeditions, we had by 1940 quite good knowledge of the western and south-western parts of the central Arctic where the drifts of the *Fram*, the *Sedov*, and of Papanin's party had taken place. However, there was too little information on the rest of the central Arctic. Some expeditions sailing in the Chukchi and East Siberian Seas tried to penetrate towards the north but did not get beyond the edge of the continental shelf. In 1928, Hubert Wilkins landed on the ice north of Ostrov Vrangelya and measured the ocean depth with an echo sounder. The depth measured by Wilkins was about 5000 m. Therefore, in the years following (including the drift of Papanin and of the *Sedov*) it was thought that the central part of the arctic basin was a single deep bowl-shaped depression, with depths of the order of 4000–5000 m.

In 1941 there was organized a short-term Soviet expedition based on a new method: the method of flying observatories. Aircraft having on board a group of scientists and appropriate apparatus landed at a particular point on the ice, made certain observations and flew on to another point. Thus, in the spring of 1941, the aircraft piloted by Cherevichnyy made three landings in the region close to that investigated by Wilkins. The depths found by this expedition showed that the ocean was here considerably less deep than Wilkins had measured. The depths in this region were about 2000–2500 m. This cast considerable doubt on the accuracy of Wilkins's depths.

The Second World War interrupted study of the Soviet Arctic, but immediately after it Soviet polar workers started preparing new expeditions. In 1948, 1949 and 1950, high latitude air expeditions were carried out. They made a large number of landings in the central polar basin, and in fact carried out a full survey of it. The studies of these three years led to an important new geographical discovery. In particular, it was established that the central polar basin was not a single deep depression, but is divided by a submarine ridge extending from Novosibirskiye Ostrova, passing east of the North Pole, to the shores of Ellesmere Island. This ridge rises about 2500 to 3000 m. above

the floor of the basin. It has steep slopes, and in fact divides the polar basin into two parts—Pacific and Atlantic. In addition, a large number of deep-water hydrological stations were occupied, and these permitted study of the extent of Atlantic and Pacific water in the polar basin itself. The investigations showed the presence of rich organic life. A not less important discovery in the central Arctic was the appearance of a particular magnetic anomaly stretching roughly parallel to the Lomonosov ridge—as the submarine ridge was called—across the whole arctic basin. On the new magnetic map the magnetic meridians, converging in the Taymyr region, continue more or less parallel towards the magnetic pole. This particular structure of the magnetic field of the central polar basin led some scientists to postulate, before these investigations, the existence in the Arctic of a second magnetic pole.

However, all these investigations, despite their range and scope, constituted only a reconnaisance of a number of natural phenomena of the central Arctic. To improve the ice and weather service and to make apparent a number of principles governing natural phenomena both in the Arctic and in more southerly latitudes, it was necessary to embark on longer systematic observations. A drifting station led by M. M. Somov and called SP-2 was established in 1950 in the eastern part of the polar basin north of Ostrov Vrangelya. The observations of this station notably increased our knowledge of the relief of the eastern part of the arctic basin, of the currents, the ice drift, and the heat balance of the ice, and, most important of all, the station systematically reported the weather and ice movements to the arctic weather bureaus, which could use this data to give more reliable information on the weather and the ice drift along the Northern Sea Route. This work particularly clearly emphasizes the need to have regular observations of weather in the central Arctic for better forecasting. This in turn means better conditions for shipping on the Northern Sea Route. That is why in 1954 the High Latitude Air Expedition, which was continuing the study of the central Arctic, was given the task of organizing two drifting stations: SP-3 and SP-4. These stations worked for a year, collected much material on various topics and also regularly supplied the ice and weather services with observations of the atmosphere, the sea and the ice.

On 9 April 1954, at 86° W and 400 km. from the North Pole, the aircraft of Hero of the Soviet Union I. S. Kotov landed. Before landing, the aircraft circled for a long time in the region, in order to choose a large and strong floe upon which to land the station SP-3. As leader of this station I was aboard the aircraft and had to inspect the region of the landing and select the floe on which to set up the camp of our party. The floe we selected stood out from the surrounding ice by reason of its size and thickness. It was surrounded by high ridges. Its thickness was about 3 m., and its horizontal dimensions 2×3 km.

From that moment onwards aircraft started flying day in and day out from the shore bases bringing instruments, equipment and stores. The personnel of the station arrived. There was soon a little village of tents and instrument huts on the floe. Radio masts were erected.

Within 10 days the full programme of observations in all subjects was under way. The hydrologists bored holes in the 3 m. thick ice and through them they lowered by motor winch a line with instruments for determining water temperature, and for taking samples in order to determine chemical composition; they made plankton hauls from various levels, measured the ocean depth and took cores of the sea bed. The meteorologists set up their instruments and eight times a day measured temperature, humidity, pressure, strength and direction

The heavy lines show the course of the five Soviet drifting stations.

of wind and changes of weather. Radiosondes were sent up. Weather reports were sent to the Arctic weather bureaus, to the Central Institute of Forecasts [Tsentral'nyy Institut Prognozov] in Moscow and to the Arctic Institute [Arkticheskiy Nauchno-Issledovatel'skiy Institut] in Leningrad. Changes in the magnetic field were measured. Every day the co-ordinates of the station were determined by the sun; having plotted them on the map we knew the direction and speed of drift of our floe.

About a hundred tons of assorted stores were brought to the station. A helicopter flew in from Moscow to reconnoitre the ice in the vicinity of the camp, to carry stores, and to carry out scientific observations aside from the line of drift. A tractor and car were brought in by aircraft. The station was equipped with everything necessary for a long period of work on the drifting ice. In May the last aircraft flew out.

The personnel of the station consisted of experienced polar workers. Many had wintered more than once in the Arctic and had taken part in high-latitude expeditions. They included:

A. F. Babenko, Helicopter pilot	G. I. Matveychuk, Meteorologist
A. I. Dmitriyev, Hydrologist	N. Ye. Popkov, Astronomer
V. G. Kanaki, Meteorologist	L. N. Razbash, Radio operator
M. S. Komarov, Mechanic	I. Tsigel'nitskiy, Meteorologist
K. M. Kurko, Radio operator	V. G. Volovich, Doctor
A. D. Malkov, Meteorologist	Ye. P. Yatsun, cinematographer

The experience of our forerunners helped us greatly. All laborious work was mechanized. Besides tents, there arrived in the spring four collapsible huts on sledge runners. In one hut we put the radio station, in another the laboratory for chemical analysis of sea water, and we joined two together to make a living room.

In the spring a brilliant sun shone for days at a time. At the end of May water appeared beneath the snow and the snow began to melt. We went about in gumboots. Puddles of melt water formed round the tents and huts. We bored holes in the ice with the mechanical drill so that the water could run away. June was calm and warm, and the temperature of the air fluctuated about 0° C. The arctic summer began. At the beginning of July there was heavy rainfall and the surface of the level floes became blue. But on 5 July there was snow, the wind blew, and drifts formed again; under the snow there were puddles. It was soon sunny weather again and there was more water than ever on the ice. Round about the floe open water appeared and small waves formed on it. Seals appeared in the open water. In the summer rare guests for these latitudes sometimes flew over our camp—gulls and Snow Buntings. Once three small ducks flew over. At the edges of the floe algae grew.

In the summer aeroplanes often flew to us. They brought scientists from various institutes of the Academy of Sciences [Akademiya Nauk]. The visitors acquainted themselves with the work of the station, carried out further investigations in the region of the North Pole and again flew away to the mainland.

The floe made loops and zigzags under the influence of currents and changeable winds, but slowly and surely moved northwards. Sharp fluctuations in depth showed that the floe was nearing the Lomonosov Ridge.

On 25 August, after 3 days of overcast weather, we fixed our position as 30 km. from the North Pole at long. 90° W., and a rapid increase in depth indicated that we had crossed the ridge. In 3 days of strong steady wind the floe drifted 80 km. At that time the summer ended, snow fell and the landscape became wintry.

At the end of October aircraft again flew out to us. Five more huts were brought and all personnel moved into them from the tents. With the onset of darkness electric light was put into all working and living quarters. In winter, as in summer, aircraft visited us regularly once a month.

The radio link worked clearly and without interruption. Weather reports

were sent out eight times daily. This was the direct practical contribution to the needs of the national economy.

The end of November brought many alarms. Deep depressions passed over the station causing strong changeable winds. Movement and hummocking of the ice started near the camp; shocks were frequently felt and the noise of hummocking heard. On 24 November, a crack in the ice passed through the camp. Most of the men were asleep and only the man on watch heard the noise. Suddenly a blow was felt and the floe shuddered. Everyone woke up quickly and ran out of the huts. All went to pre-arranged places for 'ice alarm'. The crack passed between the huts of the meteorologists and started visibly opening. It passed beneath the tent housing the magnetic instruments. The edge of the tent hung over the water, but tent and equipment were saved. In 10 to 15 minutes the floes had parted and there was open water 50 m. wide between them. We went up in the helicopter and inspected the camp and its vicinity with the searchlight. We came down on the part of the camp affected. Here men were saving equipment, pulling it away from the open water to a safer place. In a few hours order was restored in the camp, and everything again worked smoothly. A telephone line was rigged across the open water but a day later the open water froze over in a severe frost and it was possible to walk across.

As a safety measure an emergency radio station was set up in the other part of the camp in order to ensure uninterrupted transmission. The situation was anxious in the days that followed. In December the ice continued to break. On 1 December a second crack appeared, also suddenly, under two huts and a tent. This crack also started to open up quickly. There was a threat of losing the huts. Measures were therefore taken to shift the camp to a more reliable part of the floe.

In total darkness and in 40° C. of frost, all the huts and tents were moved to a new site with the help of the tractor: the old site became first open water and then a ridge. But there was no peace at the new site either—a ridge slowly approached the camp, advancing with each new onset of pressure. Finally on 24 December the hummocking stopped and it was quiet.

Cutting a way through the ridge we moved camp to another, stronger part of the floe. We shifted cumbrous stores for three days, without sleep or rest, in freezing wind, in darkness, and by torch light. Quickly, in order not to interrupt the observations, we built new instrument observation posts.

At the end of February the first signs of dawn appeared, becoming daily brighter until on 10 March the sun appeared after five and a half months absence. On 29 March full polar day began. On 16 March yet another crack passed near the camp, going through the middle of two hydrological tents. Hummocking started and it was again necessary to move tents and instruments to a new site. On 6 April the crack turned into a wide expanse of open water which again divided the camp in two, but by now it was light, everything was clearly visible, and between the two parts of the camp a safe route was established and telephone and radio communication set up.

Our station's year of drift was ending. The ice round about the camp was

much broken up. The coast of Greenland was less than 300 km. away. To the south of us, near the strait between Spitsbergen and Greenland, there stretched great expanses of open water. The Arctic Institute informed us that our relief was to be drifting station SP-5, which it was proposed to establish to the north of Novosibirskiye Ostrova. The relief of SP-4 had already been carried out.

On 20 April 1955 the flag at SP-3 was hauled down: the station had completed its work. In 376 days from 9 April 1954 to 20 April 1955 the floe on which the station stood had followed a twisting course under the influence of winds and currents for more than 2000 km.; in a straight line, 820 km.

During the whole period of the drift regular observations had been made of various meteorological elements, the vertical structure of the atmosphere, the thermal and chemical regime of sea water, movement of water masses at various depths, ocean depth, sea bottom, organic life in various water layers, behaviour of the ice cover, and terrestrial magnetism.

The course of the floe characterizes the movement of the ice of the central Arctic and the comparison of sections of this course with wind, pressure distribution and observed movements of water masses at various levels permits the formulation of further principles governing movement of ice.

The meteorological observations were immediately sent by radio to the weather bureaus of the Soviet Union. They helped synoptic meteorologists, and particularly those concerned with the 1954 navigation along the Northern Sea Route, to make more reliable weather forecasts. Besides their operational significance weather observations throw light on the development of meteorological processes at various times of the year and help to fill in the general picture of circulation of the atmosphere in the northern hemisphere.

Before the drift of station SP-1 some scientists had held the view that a stable area of high pressure exists over the central arctic all the year round—a 'cap' of cold air. The Soviet scientist B. L. Dzerdzeyevskiy, who worked up the observations of the Papanin station, rejected this view and showed that in the summer months there is no such stable region here and that both depressions and anticyclones pass across the central Arctic. The meteorological observations of station SP-3 showed that in the winter also marked depressions develop in the region of the Pole.

A year's observations of the upper atmosphere were obtained in the central Arctic. Radiosondes were sent up twice daily. The considerable number of radiosonde observations permits study of structure of the atmosphere, the physical properties and movement of air masses and the regime of the lower limits of the stratosphere when various air masses pass across the central Arctic. In winter (October–April) the presence was discovered of a big temperature inversion in the lower layer of the troposphere embracing the layer up to 5000 m., with the temperature of the upper limit 15 to 20° C. higher than the temperature at ice level. It was established that the lower limit of the stratosphere in the region of the Pole both in winter and summer does not, as was earlier supposed, get lower as latitude increases, but fluctuates considerably with the passage of this or that air mass. With the passage of a cold air mass the tropopause comes down. The minimum height of the tropopause—

4700 m.—was observed in arctic air. When warm air masses from the Atlantic or Pacific penetrate the central arctic the tropopause rises to between 11,000 and 12,000 m. This shows that the lower layers of the stratosphere are closely linked with movement of air masses at the earth's surface, and the average height of the stratosphere may change from year to year and from season to season, depending upon the circulation of the atmosphere.

The oceanographical observations permitted study in various seasons of the thawing and growth of ice, and of the characteristics of break-up and hummocking; they also increased knowledge of the distribution and movement of water masses. The plankton samples permitted study of the annual cycle of development of organisms in the water. As had been expected, the station crossed the Lomonosov Ridge and the region of the magnetic anomaly at a point close to the North Pole. Frequent soundings along the course of drift increased knowledge of the steepness of the slopes of the ridge, and of the nature of the bottom deposits. The determination of the magnetic elements provide a more detailed picture of the earth's magnetic field in the region of the Pole, and the continuous recording of the magnetic variation throws light on changes in time of geomagnetic elements which are linked to changes in a number of atmospheric and cosmic phenomena.

Thanks to the work of polar stations, expeditions and drifting stations, many natural phenomena in the Arctic have now become better known, but there is still much to be done in order to deepen this knowledge; years of systematic detailed observations are necessary. That is why stations SP-4 and SP-5 worked on the ice of the central Arctic in 1955–56.

In 1957–58 the International Geophysical Year will take place. The Soviet Union, whose northern frontiers are washed by the waters of the Arctic Ocean for many thousands of kilometres, intends to expand its study of the Arctic. For the U.S.S.R., taking part in the International Geophysical Year is a natural continuation of the large amount of research which has been done in the Arctic over many years. All countries of the world will take part in this undertaking, which is so important for the development of world science, and Soviet polar scientists will play their part in the progress of science.

AIR OPERATIONS OF THE NORWEGIAN–BRITISH–SWEDISH ANTARCTIC EXPEDITION IN 1952

BY KAPTEN REINHOLD VON ESSEN

[*MS. received 1 November 1955.*]

[The present article continues the series describing the equipment and methods used by the Norwegian–British–Swedish Antarctic Expedition of 1949–52, of which a general account was given in the *Polar Record*, Vol. 6, No. 45, 1953, p. 608–16. The Swedish Air Force unit, organized and led by Kapten von Essen in 1951–52, was exceptionally successful in its task. Although the air operations which Kapten von Essen describes in this article were small in comparison with those now taking place in the Antarctic, the lessons learnt are still important: a carefully planned air unit using small aircraft for photography of limited areas in conjunction with ground survey parties can still produce mapping results which compare very favourably with much more ambitious air reconnaissance projects.—Ed.]

CONTENTS

Introduction . . . *page* 230
Objectives 230
Personnel 231
Aircraft 231
Navigation 232
Radio equipment . . . 233
Emergency equipment . . 234
Transport to the Antarctic . 234
Airstrip . . . . . *page* 234
Weather 235
Air operations in Dronning Maud Land 235
Air photography . . . 235
Preparations for evacuation of the expedition by air . . . 236

Introduction

On 1 November 1951 *Norsel* sailed from Göteborg on her third voyage to Maudheim; this time to evacuate the expedition. On board were the personnel and two aircraft of a Swedish Air Force unit. Air reconnaissance had been carried out in the expedition's first season by a British R.A.F. Flight. In the second season a Norwegian commercial flying unit had done some photography, and in the final season it was the turn of the Swedes to provide these services. In preparation for this the writer, who commanded the unit, had accompanied *Norsel* on her second voyage, and had thus been able to study the area, and discuss plans with members of the expedition.

Objectives

Three main tasks were to be carried out by the air unit in 1952: sea-ice reconnaissance for *Norsel* during her voyage through the pack ice, air photography of the expedition's area of operations to assist the topographical survey, and preparations to evacuate the expedition by air should *Norsel* be unable to reach Maudheim through the pack ice. It was planned to take photographs up to about 1000 km. from the base.

Personnel

Members of the air unit were:

Kapten Reinhold von Essen, Officer-in-charge, first pilot
Fanjunkare O. Wijkman, Second pilot
Fanjunkare R. Nilsson, Air radio operator and navigator
Fanjunkare C. Å. Edin, Ground radio operator and mechanic
Flygplansmästare A. Hellström, Chief mechanic
Flygtekniker U. Jegestad, Mechanic

None of the men had had previous experience of Antarctic flying. A Norwegian photographer, Helge Skappel, using Norwegian equipment, took the photographs, as Norway was responsible for all mapping during the expedition.

The unit was just large enough to carry out the programme, but an increased number of flights would have required a staff of twelve: a group leader, a first and a second pilot, two air photographers, two navigator/radio operators, two ground signallers, one instrument mechanic and two aircraft mechanics. Experience emphasized the importance of the navigator during polar flights. It was found, for instance, that the most satisfactory division of responsibility was for the officer-in-charge to be pilot during flights, to enable the navigator to concentrate exclusively on his calculations. Similarly, in selecting navigator/radio operators, emphasis should, it was learnt, be placed on navigational, rather than radio, qualifications.

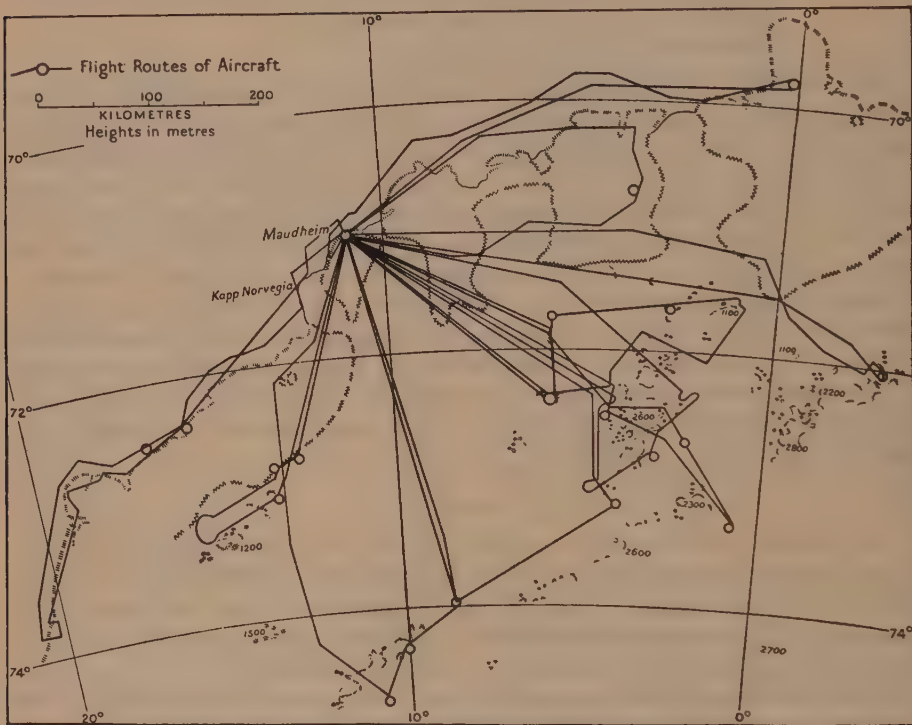
Aircraft

For reasons of safety two aircraft were required, one twin-engined, large enough to carry a photographer and his equipment in addition to a crew of two, and with a flying range of 1800 km., and a smaller one. The maximum height of clouds in the area was about 4000 m., so it would be necessary for the survey plane to be able to fly, fully loaded, above this height.

Choice of aircraft was restricted by availability, and it was decided to use a twin-engined "Beechcraft 18R", and a SAAB single-engined "Safir". The "Beechcraft" had been used for ambulance work in northern Sweden for some ten years. Its permitted flying load was 3600 kg. Test flights, however, showed that the length of the take-off was only slightly increased, and the flying height of over 4000 m. remained unaffected, if this load was increased by 600 kg. A flying load of about 4200 kg. was therefore used. An extra tank to carry 300 litres of fuel was fitted, also equipment for oblique photography, additional navigational instruments and three portable oxygen outfits. The smaller aircraft was fitted with an extra fuel tank to increase her flying range to about 1000 km.

Both aircraft were free from engine trouble throughout the operation, and were able to begin their homeward flight after only a brief overhaul. The air-intake in the carburetter of the "Safir" developed a "cough" at low temperatures; it showed no tendency to stop working, but the noise did not inspire confidence. The heater brought to warm the engines was not used as the black hoods with which they were covered absorbed so much radiation that they

quickly became warm enough for starting once the sun had risen a few degrees in the sky. Covering hoods were also used to protect the aircraft from ice forming on the fusilage and wings. It was found that coverings for the wings should be provided with "spoilers" on the top to reduce the lifting power of the wing, and so reduce the strain on the anchoring ropes. The camera required all the warm air available from the engine and so the aircraft's



Flight routes of the Swedish air unit in Dronning Maud Land, December 1951–January 1952.

windscreen had to be de-iced with the help of an alcohol-glycerine mixture, which was found to be an unsatisfactory system.

Before leaving Sweden the aircraft were sprayed with "Rust Ban", an anti-corrosive mixture supplied by the Esso Oil Co., and this gave complete protection. In one place, where the spray had accidentally been removed, the salt water corrosion during transport was found to have penetrated the metal to a depth of nearly 1 cm. in twelve days.

Navigation

The method of navigation used was to check drift during an outward flight by means of direction finding to the base up to 200 km., the limit of the very high-frequency range. Thereafter navigation was by dead reckoning until the returning aircraft was again within range of the base. The method worked

satisfactorily; checks, over points of which the positions were known, showed that the navigational error did not exceed 5 per cent of the outward distance. Each aircraft was provided with an automatic sun compass, with which to check the course, and the survey aircraft also carried an astro-compass. The sun-compasses were used successfully when the aircraft were directed into the sun, and checks were made with the astro-compass when flying away from it. Both aircraft made use of directional gyros, which proved very accurate. During the first 40 flying hours their error, measured over half an hour, was less than 1 per cent. After 40 hours' flying, however, it increased slowly for every hour. The magnetic compasses were rendered useless by inadequate screening of the electric system of the aircraft. A bubble sextant was taken for use in the event of a breakdown of the electric system. Test readings showed that fixes were correct to within 12 nautical miles, which was considered satisfactory. The survey aircraft was fitted with a speed and drift indicator for checking speed during flight. This could, however, only be used when flying over open water with ice floes; over ice sheets there was insufficient surface detail to make determinations possible. The AN-APN I radio altimeter was also unreliable over solid surfaces, probably due to the varying density of the snow surface. It gave good results over open water.

Mercator sheets of the area were found very useful both for plotting during flight, and for subsequent charting of flight lines. During flights a track chart was plotted both in the aircraft and at the base; after landing, charts were compared and adjusted in the light of direction finding figures obtained during the return flight.

The method of flying along a pre-determined track by observing position lines of the sun was tried once. It appeared to be a satisfactory method of navigation when there were no radio aids.

Radio equipment

Equipment was carried in each aircraft to maintain continuous contact with base while flying, and to determine position by direction finding within the range of the radio beacon at the base.

The dry snow of the inland ice sheet is a poor conductor of low-frequency waves, and short-wave transmission was therefore used. The wintering party had discovered that reliable communication by short wave depended on the ability to change frequency within a relatively broad band, between 2 and 18 m/c. It was not possible, however, to obtain the most suitable equipment in time, so the survey aircraft was fitted with a combined high- and low-frequency transmitter working within the high frequency band 3 to 5 m/c. Both aircraft carried 10-channel, very high-frequency equipment for radio navigation and communication. At a flying height of 4000 m. this gave a range of about 200 km. The low-frequency direction finder and the radio compass were of little use as their range was only about 50 km., and their deviation considerable. The very-high-frequency direction finder, however, worked well.

The normal equipment of the *Norsel* was sufficient to meet requirements within the low- and high-frequency bands, with the addition of a very-high-frequency direction finder with the aerial mounted at the top of the mast.

At Maudheim a prefabricated traffic control tower was erected on the landing strip. This contained a very-high-frequency, and a low-frequency, direction finder, a combined long- and short-wave transmitter-receiver, and a long-wave radio beacon. The range of the radio beacon was extended by suspending the aerial from balloons. The result, however, was not encouraging.

Emergency equipment

Provisions and emergency equipment were carried for three men for one month, the food being packed in two boxes, each weighing about 20 kg. Equipment included a tent, sleeping bags with air mattresses, an ice axe, snow shovel, small radio transmitter, rifle, nylon rope, skis and spare clothing. The total weight of this equipment was 170 kg. None of it was used, but it was all tested at Maudheim. Sleeping bags stuffed with reindeer hair were only efficient for a short time. After about a month the reindeer hairs got broken and the bag lost much of its insulation.

Transport to the Antarctic

The two aircraft and the unit were transported in the *Norsel* (600 gross registered tons). A platform was erected aft of the superstructure to carry the aircraft. The "Beechcraft" was placed the further forward and was protected from constant drenching by salt water by a box-like construction of steel pipes and wood. This also protected the wings of the aircraft, which were dismantled. A beam was laid on the platform with two jack heads fitted into the lifting points in the wings, this supported the greater part of the weight of the machine. The fuselage was lashed down with steel wires adjusted with turn buckles.

The small machine, which had to be available for ice reconnaissance during the voyage, was carried with dismantled wings, and was fitted with a float undercarriage. It was placed aft of the "Beechcraft" with its tail projecting about 1·5 m. beyond the stern of the vessel.

Airstrip

An airstrip was marked out on the ice shelf about 2 km. from Maudheim and the same distance from "Norselbukta", the "port" for Maudheim.

A telephone cable laid between the airstrip and Maudheim proved very useful during spells of unsettled weather.

In order to assist in the estimation of height when landing aircraft, the outline of the airstrip was marked by spraying the snow with lamp black; but this absorbed so much radiation that a deep ditch was formed. Lines of small red flags proved more satisfactory. The prefabricated hut, consisting of four wall, one floor, and two roof sections, could be erected in 30 minutes. It was

large enough to provide working space for two men and for all equipment. Repair and maintenance equipment was of the standard type used by the Swedish Air Force, and proved entirely satisfactory.

Weather

During the period of 14 days' operations in the Antarctic the weather prevented flying on only four.

Occasionally, when flying near the mountains bordering the polar plateau, the aircraft became caught in down currents, and was forced down into the clouds. The vertical wind component was about 2 m./sec. at these times. On several occasions, too, heavy ice formed on the carburetters during flights in completely clear weather; this could only be removed by applying carburetter heating at full power. The icing probably resulted from supercooling, which arose from the lack of condensation nuclei in the atmosphere.

It was often difficult to distinguish between clouds and snow surface, a condition known as "whiteout".

Air operations in Dronning Maud Land

Norsel reached "Norselbukta" on 22 December 1951. During the voyage the "Beechcraft" had been fitted with a ski undercarriage and the wings and camera equipment mounted. She was lowered on to the ice from the ship and flown to the airstrip. The "Safir" was equipped with skis in place of floats by 1 January 1952. By the evening of 23 December 1951 the "Beechcraft" made a trial flight. Between then and 8 January 1952 the programme of photography was completed in nine major flights. The total flying time was 75 hours. Coastal flights ranged from the Greenwich meridian to long. 20° W., and inland flights from long. 3° E. to 16° W., and as far south as lat. 74° 40′ S. (see map).

The aircraft were then loaded on board *Norsel*, for the return journey.

Air photography

The camera used was a Zeiss R.M.K. 21 air camera, with a focal length of 21 cm. The size of the photographs taken was 18 by 18 cm. The camera was fixed on to a sprung plate in the floor in the aft compartment of the aircraft. It could be swung from side to side and had a full range of view. It worked satisfactorily except during two flights when double exposures resulted from stoppages in the casette mechanism.

Photographs were taken at regular intervals during a flight, and at the end of each "leg" the aircraft made a complete circle taking photographs as it turned. All photographs were taken with a 60 per cent overlap. Flying heights varied during different flights between 2500 and 4200 m. The exposure used was $\frac{1}{150}$ sec. at an aperture of F. 4·5. A "D" type orange filter was used, and Gevaert Avi Panchro Microgran 27° film. A total of about 1850 oblique exposures were made. Photographs were slightly underdeveloped and over-exposed in order to obtain softer pictures and to emphasize shadows.

Preparations for evacuation of the expedition by air

Had this operation been necessary it was planned to fit floats on the aircraft. This was because there were so few floes in the pack ice large and stable enough for a ski-equipped aircraft to land on. The writer's experience in Sweden had shown that aircraft with un-reinforced floats can safely land, and take off, on snow and ice, as well as water. It was proposed to use this technique at Maudheim. The ice shelf near the base was found to be suitable provided that skavler were levelled with a scraper towed behind a weasel. A parking place was made with a wooden floor to eliminate the danger of the floats freezing on to the snow while the aircraft were being loaded. In the event, however, *Norsel* was able to reach "*Norselbukta*" and relieve the expedition.

Twin-engined "Beechcraft", 18 R aircraft, on air-strip at Maudheim

Survey aircraft on *Norsel*, "Norselbukta"

Air operations of the Norwegian-British Swedish Antarctic Expedition, 1952

Photographs by Helge Skappel

(*Facing p.* 236)

S-51 Sikorsky helicopter on flight deck of *Oluf Sven*

"Canso" aircraft on steel track slipway at Deception Island

Falkland Islands and Dependencies Aerial Survey Expedition, 1955–56

Photographs Hunting Aerosurveys Ltd.

AIR SURVEY OF THE FALKLAND ISLANDS DEPENDENCIES, 1955–56

BY P. G. MOTT

[*MS. received 15 May 1956.*]

CONTENTS

Introduction	*page* 237	Radio control station	*page* 239
Personnel	237	Air operations	241
Aircraft	237	Photography	242
Transport to Antarctica	238	Ground control	243
Base	238	Conclusion	244

Introduction

In 1955 Hunting Aerosurveys Ltd. were awarded a contract by the Colonial Office to carry out a survey of Graham Land and the South Shetland Islands. The survey was to be made by means of air photography and ground control. The base for the operation was at Port Foster, Deception Island, where an ice-free anchorage for flying boats could be expected during the summer months. The survey is to be continued in 1956–57.

Personnel

The members of the expedition were P. G. Mott, leader; J. H. Saffery, deputy leader and flying manager; C. B. Gavin-Robinson, J. Greenshields, D. Banks and L. Terry, "Canso" pilots; M. Mugford, R. Keen and M. Kane, aircraft engineers; H. F. Lewis and E. Green, air photographers; W. Freeman and P. Davies, camera operators; A. Arkinstall and P. Remmers, laboratory photographers; A. Bancroft, R. Mitchell, C. Brown and F. Sherrell, surveyors (the latter also served as geologist); Dr W. E. McCready, medical officer; M. Milburn, J. Corlett and F. Shaw, radio communications officers; G. L. Jacques and S. A. Holdaway, helicopter pilots; T. Howie and T. Frost, helicopter engineers; B. Everett, cine-photographer; D. Exley, cook, and D. Lee, steward.

Aircraft

No airstrip was available that was long enough to serve a land-based aircraft of sufficient power to carry out the required flights. Two "Canso" aircraft, the amphibian version of the "Catalina", were selected for the air survey; these aircraft have a very long flying range and are capable of being beached if ice floes were to drift towards their anchorage. The aircraft were modified in Canada to carry both vertical and oblique cameras, and one of them was fitted with an airborne magnetometer. They left Canada on 26 November 1955, reaching Montevideo on 13 December and Port Stanley on 1 January 1956. There they waited until the base was ready for them, and

finally arrived at Deception Island on 10 January. Two 5.51 Sikorsky helicopters were taken out, crated, on the *Oluf Sven* to assist in the ground control work.

Transport to Antarctica

For the transport of the expedition personnel and equipment, and to serve as a mobile base for helicopter operations, the 950-ton Danish freighter *Oluf Sven* was chartered. The ship was converted to provide accommodation for twenty-two members of the expedition's technical staff. A removable flight deck for helicopters was fitted, which occupied very nearly half the total length of the ship, and was so designed that it could be stored in the hold during the outward voyage and reconstructed on arrival at the base. She also carried 60,000 gallons of aviation fuel, for which a special gas-tight bulkhead separated the forward hold from the rest of the ship. She left London on 21 October and arrived at Deception Island on 3 December.

Base

The whole of December and part of January were taken in preparing the base. A living and working hut 60 ft. (19 m.) long was erected from prefabricated parts, and supplied with power and light for the processing and drying of the air film. Water had to be pumped from a neighbouring melt stream and stored in a series of aircraft fuel tanks that were designed to fit conveniently inside the rafters of the hut, where there was little danger of freezing. During this period, a total of 500 tons (508,000 kg.) of aviation fuel and stores, varying from aero-engines and hut parts to sacks of coal, were unloaded from the ship by means of a military type of pontoon raft, in the absence of a jetty in Whalers Bay. This unloading took longer than expected, owing to the confined working space on the ship and the size of the items handled.

Moorings. Two moorings were laid in Whalers Bay. These were supplied by the British Admiralty and were of standard pattern. The anchors weighed 750 lb. (340 kg.) each and were dropped in a depth of approximately 22 fathoms (40 m.), attached by chains 360 ft. (112 m.) long to rubber buoys of 55 in. (1·4 m.) diameter. Each buoy was also attached to the shore by a landline consisting of 400 ft. (122 m.) of nylon rope and 200 ft. (61 m.) of light chain. The chain simply lay in the ash of the beach and served to moor the nylon line so that if the buoy dragged its anchor it could be recovered from shore. No trouble whatever was experienced with these buoys, and the aircraft rode out gales of up to 55 knots without damage or difficulty.

P.S.P. track. The shore of Deception Island is composed of volcanic ash which, either dry or wet, is too soft for beaching a large aircraft. To overcome this difficulty, 10 tons (10,160 kg.) of perforated steel plate, such as was used to make temporary airstrips during the war, was taken out. The plates, which are in 10 and 5 ft. (3 and 1·5 m.) lengths, are interlocking and fastened together by steel clips, providing a smooth firm surface that will carry very heavy aircraft and withstand any amount of wear. With this material, a slipway,

approximately 220 ft. (67 m.) long and between 28 and 44 ft. wide (8 and 14 m.), was laid extending well below the level of low water at spring tide. While this permitted both "Cansos" to be accommodated on shore at one time, it still did not give sufficient area to turn the aircraft and to permit the "Canso" farthest inshore to bypass the other and enter the water first if required. Therefore 5000 bricks, which were recovered from the old whaling station, were used to extend the hardstanding by laying them over sheets of corrugated iron buried in the ash.

Re-fuelling. Whenever the aircraft were at their moorings, re-fuelling was from the shore by means of a 300 ft. (91 m.) pipe-line, carried on floats. All fuel was carried in 44-gallon (198 litre) drums, and delivered to the line by means of a petrol-driven "Sudan" refuelling unit.

Tractor. A 5-ton diesel tractor proved a most useful article of equipment It was used to clear the hut site of snow and a 6-inch layer of hard ice, to transport several hundred tons of equipment and stores from the landing beach, to bulldoze tracks and move quantities of material, and to tow the aircraft when on land.

Folding boat equipment. Another essential piece of equipment was a military-type raft, consisting of two collapsible pontoons joined together by steel transoms which supported light girders carrying a track. At either end are long articulated ramps, which act as counter balances when the load is unequally distributed, and can be accommodated to any slope of beach. Individual loads up to 6 tons in weight were ferried ashore on this equipment, with which the entire unloading operations were completed without loss or damage to a single item. The raft was also used to lay the moorings.

Motor launch. For towing the aircraft to and from their moorings, and as a general safety and patrol craft, we used a British Admiralty pattern seaplane tender fitted with a Perkins Marine diesel engine. The boat was capable of a speed of 12 knots, and well suited to its task in sheltered waters. The inner harbour of Deception Island can, however, become very rough on occasions when, in addition to providing the crew with a thorough soaking in ice-cold water, the boat required very skilful handling to avoid being swamped. Another disadvantage was the fact that the propeller was lower than the keel and quite unprotected against ice or the countless pieces of whale bone and old iron which line the bottom of Whalers Bay.

Despite these shortcomings, the launch proved in general extremely reliable and carried out the combined duties of aircraft tender and picket boat.

Radio control station

Deception Island has a reputation for orographic cloud which hangs round the mountain rim and often sinks into the bowl of the "crater", descending to 500 ft. (153 m.) or even less. Since the southern limit of the area to be photographed was 400 miles (643 km.) distant from the island, and there was no suitable alternative base, it could easily happen that an aircraft, having taken off in the morning in good weather, might return from a long sortie to find

visibility at the base reduced to nil. To offset this danger we had to provide two forms of approach aid. The first was a medium-frequency radio beacon of 600/800 W. output, and the second a radar device known as "Rebecca-Eureka" for use on the final stage of the approach; this gives the navigator both bearing and range so that he is able to tell when it is safe to descend. For general communications a high-frequency transmitter of 300 W. output was employed, usable by RT or CW, with the choice of three transmitter aerials depending on the frequency in use. Finally, to provide for local communication between ship, aircraft, field parties and control base, a 50 W. very-high-frequency system was installed at Deception Island, with a 15 W. set on the ship, and a number of 5 W. portable battery sets for use with field parties. In practice, very-high-frequency reception proved of varied reliability, and often gave some surprising results. In some cases excellent reception was had with the portable battery equipment, even though a mountain 1700 ft. (518 m.) high overshadowed the base station. At other times the extreme range, ground to ground, fell to 15 miles (24 km.), or even less in very unfavourable circumstances. The aircraft, however, could nearly always be worked up to 100 miles (160 km.) range, largely dependent on flying height.

Air operations

Service ceiling. Tests carried out in Canada gave a service ceiling of about 16,000 ft. (4878 m.) for the "Cansos". In Antarctica, however, it was found that at 15,000 ft. (4573 m.) vibration made vertical photography impossible. With the standard Pratt and Whitney 1830/92 engines the ceiling for photography proved to be about 13,500 ft. (4116 m.). It was also discovered that the heating system of the aircraft did not operate satisfactorily at greater altitudes.

Duration of flights. With a fuel load of 850 gallons (3825 litres) and maximum all-up weight the theoretical maximum length of flight of a "Canso" is approximately 12 hours, or 1200 nautical miles (2220 km.). Operating in Antarctica, however, it was considered necessary to allow a safety margin of 2 hours' fuel in case of emergency. Local conditions are such that the wind will often veer round from N.E. to S.W. at very short notice, and it is not uncommon to experience a dead calm in one part of the area when there is a gale of 70 knots blowing in another. Meteorological information is necessarily very limited, and the weather so changeable that the best any forecaster can do is to give a very general prediction of conditions over an area. Moreover, there was only one base from which it was possible to operate so large a seaplane. Therefore the limiting range for photographic purposes is unlikely in practice ever to exceed 300 miles (482 km.) which, from Deception Island, extends to latitude 66° 30′ S. Beyond this limit, the expectation is that air photography can only be undertaken by an aircraft fitted with skis operating from a southern base, and working either off the sea ice in the early spring, or possibly from one of the large glaciers flowing down from the interior, or even from one of the many large ice-capped islands.

Flight planning. Although the Falkland Islands Dependencies is the best mapped area in Antarctica, the existing charts are not sufficiently accurate for survey navigation. As we were working at the end of the operational season, we had to make the maximum use of any chances of photographic weather. It was therefore decided that, in the case of the islands, it was better to risk incomplete strips and try to obtain cover of small areas in one sortie without resort to navigational strips, leaving it purely to the skill of the navigator to guide the aircraft by visual reference to points memorized or sketched from the previous strip. Four of the larger islands were covered in this manner, at the expense of some re-flying, but experience soon showed that, in addition to placing a severe strain on the navigator, the results were hardly good enough to justify such a procedure even as an expediency.

We therefore reverted to the system of flying long control strips (in one instance the length of the strip extended for 120 miles (191 km.)), employing the gyro-controlled DR compass combined with computed drift to maintain the aircraft on a straight course. On return to base, the control strips were processed and printed overnight, every alternate print being stapled to the next in order to provide a continuous photographic record of the previous day's flight. As soon as conditions were again favourable over the same area, the two strips either side of the control strip would be flown, lateral overlap being maintained by continual reference to the central strip of control photos. The second day's photography would then be processed, and used to control that of the third sortie, and so on. By this means there is no need to rely on the navigator's memory and, even in areas of very limited detail, straight flying and lateral overlap can be maintained with remarkable consistency. The only difficulty lies in areas of extreme relief, where the amount of lateral overlap will change abruptly, and in some cases requires a gap filler to avoid "curl" of the strips. Previous inspection of the control strips will show both the extent and location of any excessive height distortion. This can then be allowed for when planning the flight, by working between the extreme limits of range of the specified lateral overlap. Where necessary, a gap can be left to be filled, as in cases where the effect of relief pushes the overlap above or below the limit. This condition applies to radar controlled navigation just as much as to visual methods.

Photographic flights. The first flight was made on 5 February and a satisfactory cover was made of Snow Island and Low Island, together with one strip of Smith Island, and a control strip on Livingston Island. The flight had to be cut short owing to the failure of the heating system in the forward cabin. On the 6th both aircraft flew over and photographed Smith Island, Trinity Island, and made four runs over the Palmer Coast, east of Trinity Island. Because of cloud, vertical photography of Brabant Island was not possible, but a number of oblique photographs were taken. On 11 February a strip of 120 miles (191 km.) long was photographed extending from the Palmer Coast to the northern tip of the Trinity Peninsula. Only one other flight was possible, on 6 March, when Ohlin Island, off the west coast of Graham land, was photographed.

Photography

Camera installation. All vertical photography was undertaken with Williamson Eagle IX cameras, fitted with a lens of 6 in. focal length and 9 × 9 in. format. Consideration was also given to the use of the Wild RC 7 with Aviogon lens, but the dimensions of the camera mount and body are too great to permit installation in the limited space contained in the aft compartment of a "Canso". In addition to providing complete vertical cover, the specification asked for a continuous series of fixed oblique photographs which were made with a Williamson F. 24 camera of focal length $3\frac{1}{4}$ in. and format 5 in. square. Only one oblique camera was used with axis directed at a fixed angle of 30° to the horizontal, and at right angles to the line of flight. The camera compartment was located immediately aft of the step in the hull, where it is normally free of contact with the water. To provide for a watertight hatch, the vertical camera mount was fixed to a sliding carriage, which could be moved forward, leaving the opening in the hull to be filled by a port hinged at one end, and capable of being lowered and bolted. The design and manufacture of this installation was carried out by Kenting Aviation, Ltd., an associate of the Hunting Group in Canada, and proved entirely satisfactory.

Exposure and processing. At first sight, the overall cover of snow in Antarctica might appear to simplify the photographer's problem, for he has only one type of surface to consider. In fact, however, this is far from being the case. Over the high plateau, the glaciers, and ice shelf and the ice-covered islands, the unrelieved sameness of texture and tone require the most exacting assessment of exposure and development, without which the small variations in relief will be indistinguishable. Conversely, in the areas of high relief there is an excessive amount of contrast, due partly to the brilliance of reflected light off the snow surface, and also to the low inclination of the sun in high latitudes. Undoubtedly, however, the photographer's most difficult problem of all lies in the coastal regions, where the importance of seeing every detail of the off-shore reefs and rocky islands is in direct conflict with the requirements for even exposure of the snow-covered coastline. There is no satisfactory answer to this latter problem, short of photographing the area twice, exposing in one case for the snow and in the other for the rocks.

All the air photography was carried out on Ilford Hyperpan air film using a minus blue filter (comparable to Wratten G), the average exposure time being $\frac{1}{200}$ sec. at aperture F. 11. For development of the first test film of vertical photography, Kodak D19B was used, but it was found that this produced such high contrast that detail in the flatter snow areas was almost entirely lost. All subsequent films were, therefore, processed in D76, which gave much softer results, but usually required 30–40 minutes in the developer.

The oblique photography, due to different incidence of light, requires exactly the reverse type of treatment. In their case the D76 developer barely produced an image, even after 50 minutes of development. Eventually, by a process of trial and error, it was found that using D19B at one-quarter strength, with average development time 14 to 15 minutes, gave the best results.

Processing laboratory. The building erected by the expedition provided a darkroom and a drying room for photographic work. The darkroom was divided into two compartments, one half being used for processing the film, and the other for contact printing. Processing was carried out by tank development, using standard Morse units. Two rotary film driers were used for drying the film. The power required for these and other photographic equipment was in the region of 7·5 kW, which was provided by two Enfield 6·5 kW. generators working on independent circuits.

Ground control

A suitable location for the base-line was found on the western shore of Whalers Bay. All measurements had to be made between low and high tide, as the greater part of the line was below the high-water mark. A 100 ft. invar tape was used, and agreement to one part in 500,000 was obtained between three successive measurements made on the same day. An interesting feature of the measurement was the grading of the line beforehand by means of the tractor, using a bulldozer blade.

The measured base of approximately 800 m. (2624 ft.) was then extended by triangulation to a base some 8 miles (13 km.) long between the two highest points of Deception Island, Mount Pond on the north and Mount Kirkwood on the south. Included in the extension scheme was a point known as Collins Point, for which the geographical co-ordinates were taken from a previous Admiralty astronomical fix.

A high and continuous gale at the end of January lasted a whole week and made it impossible to fly the helicopter. It was not until 6 February that the first operational flight was made, during which two members of the expedition were landed on the summit of Mount Pond, at a height of approximately 1700 ft. (519 m.).

In addition to landing personnel and equipment, the helicopter was also used for transporting empty fuel drums for the construction of survey beacons in places where no rocks were available for the construction of cairns.

Despite high wind and cloud, considerable progress was made with the start of the control survey during February. During this period, three separate camps were established by helicopter; one on the north-east end of Snow Island, one on the south-east point of Livingston Island and a later camp on Astrolabe Island in Bransfield Strait.

Four main stations were occupied and observed, and sufficient control completed for the accurate survey of Deception Island, Snow Island and Livingston Island. The whole of this work was carried out in 2 weeks, including a period of 4 days continuous blizzard and very high winds.

At the end of February and the beginning of March an attempt was made to connect the South Shetland group of islands and the mainland of Graham Land. A party of three surveyors with 3 weeks' rations was landed by helicopter on Astrolabe Island, where they remained for 14 days, until 10 March. The two highest points of the island proved inaccessible, but they succeeded in reaching

the third highest peak, which is suitable for a trigonometrical station. Because of continuous low cloud during the whole period, the party was unable to make the desired connexion.

Both Astrolabe and Ohlin Islands, which lie some 60 miles distant from Deception Island and are suitably placed for making this connexion, have now been well reconnoitred, and there is no doubt that the rays can be observed with or without the assistance of helios in the excellent lighting conditions which occur during December and January. Our reconnaissance this season has shown that once this connexion is completed, the whole of the remaining contract area can be linked satisfactorily by a triangulation, the sides of which do not exceed 25 miles (40 km.). By keeping the heights of the normal trigonometrical stations below the average cloud height, namely 1500 ft. (457 m.), the work can proceed on practically all days except those of high wind or precipitation.

Beacons. The efficient marking of survey points in Antarctica often presents a problem, because so often there is no available rock with which to make cairns. Moreover, because of the exceptional visibility, the average observing distance is 25–30 miles, and the beacons must therefore be sufficiently large to be seen at this distance. We overcame this problem by using empty 44-gallon fuel drums. A suitable load for the helicopter proved to be three drums, weighing about 250 lb. (114 kg.), which were strapped together and dangled below the aircraft on a rope. When over the survey point, the passenger cut the rope and the drums landed within a few yards of the trigonometrical point. Three such drops provided the materials to construct a beacon 9 ft. (2·8 m.) high and 6 ft. (1·8 m.) across. Aluminium angle was used to strap the barrels together, but was not entirely satisfactory, and it is proposed next year to use a steel-banding machine. Such a beacon is held in position by wire guys attached to 4 ft. (1·2 m.) stakes driven into the 'firn' snow. The barrels were already painted red and were clearly visible at 25 miles (40 km.) range. This method would, of course, not be practicable without the help of a helicopter.

The same number of barrels can be used to make a solid circle of about 10 ft. (3 m.) diameter and 3 ft. (0·9 m.) in height. Against the absolute whiteness of the background such an object can be relied on to show clearly on vertical photographs at $\frac{1}{30,000}$ scale.

Conclusion

By the beginning of March both weather and light were rapidly deteriorating There were only 4 hours of the day in which air photography could be undertaken and, even then, the extent of mountain shadow and low actinic intensity were seriously influencing the quality of the photography.

On 13 March the aircraft were damaged in a violent gale, and further photographic flying was out of the question. After temporary repairs the "Cansos" left for the Falkland Islands on the 26th.

Before returning to Great Britain, the *Oluf Sven* made a voyage south to lat. 60° 40′S., with the object of searching for a possible advance base for

the "Cansos", also to carry out a general reconnaissance for the extension south of the survey control.

The Argentine Islands in lat. 64° 15′ S. had been successfully used by the British Graham Land Expedition in 1935 as a base for the operation of a small float plane. Unfortunately, our hopes of using these islands as a base for the "Cansos" quickly faded when, on arrival with the ship, we found the small harbour there to be full of floes and icebergs which, on several occasions, even proved a menace to the ship. While it is probable that an open stretch of water could be found at any time during the summer months of sufficient size to allow a "Canso" to land in an emergency, the experience gained on this southern voyage makes it unlikely that any permanent anchorage for a flying boat exists outside of Deception Island.

At the end of 10 days the *Oluf Sven* returned to the main base at Whalers Bay, and after closing down the installations there, sailed for the Falkland islands on 7 April.

During the 62 days which the "Cansos" spent at Deception Island air photography was possible on only 4 days though there were 18 fine days in the previous 6 weeks. In a total of 24 flying hours twenty-two flights were made and 732 successful photographs taken. The area photographed was about 1200 sq. miles (3120 sq.m.) covering Smith, Low, Snow, Rugged and part of Livingston Islands in the South Shetland Islands; Trinity Island; part of the Palmer Coast and a control strip 120 miles long extending the length of Trinity Peninsula.

The small area photographed this season is naturally a disappointment, but against this can be placed the setting up of an elaborate base and the gaining of a great deal of experience.

In the second season, with all necessary services and aircraft fuel already in position, we should be able to begin flying early in December, and thus gain the benefit of the good weather at that period. Provided we get a total of 24 days suitable for photography over the whole season, as occurred last summer, the major part of the programme will have been completed.

METAL BUILDINGS AT THE FRENCH ANTARCTIC BASE ON ILE DES PÉTRELS

BY BERTRAND IMBERT

[*MS. received 9 May 1956.*]

CONTENTS

Introduction	*page* 246
The shell	247
Foundations	247
Thermal insulation . . .	247
Heating and ventilation . .	250
Arrangement of rooms .	*page* 251
Doors and windows . . .	251
Erection	252
References	252

In 1955 a new station was opened at Ile des Pétrels, off the coast of Terre Adélie, as part of the French contribution to the International Geophysical Year. The author and M. Vallette,[1] who had planned the station at Port-Martin, investigated the properties of a number of prefabricated buildings in order to choose the most suitable type for the new station. The record of fires in polar buildings made it obvious that the materials used should, if possible, be non-inflammable in addition to being light, compact and easy to handle. Finally a metal type was selected, made by the firm of Fillod, Florange, Moselle. These buildings have many advantages. They are non-inflammable, and therefore fire breaking out inside them would be comparatively easy to control; in the fire at Port-Martin (in 1952) a hole had been burnt through the wooden roof of the hut and the forced draught so created, with the aid of a strong wind, made control of the fire impossible. These metal buildings are 30 per cent lighter, and far less cumbersome, than wooden prefabricated buildings of the same size. Fillod buildings had been in use on Ile Amsterdam since 1950 and Iles de Kerguelen since 1951 where they had successfully stood up to winds of 200 km./hour. The U.S. Navy had tested these buildings and proved that they could withstand weights of snow equivalent to 140 kg./sq.m. and a wind force of 160 km./hour.[2] The average wind force at Ile des Pétrels was 34·2 km./hour.

Further tests were carried out by R. and Y. Vallette, consulting engineers, and Professor M. Geminard of the Conservatoire des Arts et Métiers. On their recommendations a sleeve was added to strengthen the struts, the rigidity of the framework was increased, and also the thickness of the steel plates forming the walls, in order to counteract the drumming effect of gusts of wind. The Institut de Récherche de la Sidérurgie analysed the temperature of transition of a specimen of the steel normally used in their construction. This temperature, in conditions under which the hut would be used, is about −50° C. Both the Institut and the U.S. Navy[3] recommended the use of steel with a high manganese content and a small quantity of vanadium in order to raise the limit of elasticity. Unfortunately there was not time to follow this advice.

The shell

The Fillod shell (see Fig. 1) consists of a framework of sections of steel 3 mm. thick bolted to a T iron every 1·05 m. The sheets of ribbed steel forming the outer walls are 1·5 mm. thick and are fixed to the framework with clamps and bolts. Each complete section is 1·05 m. long. A width of 7·9 m. and lengths of 12·7 and 19 m. have been chosen for the workshop and living hut. The living hut is to be enlarged to 25 m. in 1957. The inner surface of the steel walls is coated with "Blackson", an anti-corrosive and soundproof preparation commonly used in the motor industry. The outside is protected by coats of glycerophalic paint, and a final coat of pale grey paint which will be renewed each year. Bolts are protected by a wash primer.

Foundations

As at Port-Martin, the ground at Ile des Pétrels is rocky and uneven. It consists of gneiss and granite and is unsuitable for large-scale levelling, even with the aid of explosives. Platforms to support this building will therefore be erected on standard tubular scaffolding (see Fig. 2). The vertical scaffolding poles, resting on the ground and cut to the same level, are attached to adjustable supports which ensure that the platform is completely horizontal. On the scaffolding is a raft of steel girders which supports the walls and floor of the living hut; in the case of the workshop it is of wooden beams, bolted at intervals of about 60 cm. The raft is braced by diagonal ties and moored to the ground with "Boltex" expansion bolts.

In the workshop building the floor is made of sections of cork between plates of aluminium, which has a chequer-plate surface. The three generators rest on an independent floor to minimize vibration. The living hut floor is of corrugated sheet steel fixed by clamps to the supporting girders.

Thermal insulation

The choice of a steel shell posed the difficult problem of thermal insulation. It would form a perfectly vapour-proof barrier, but a cold one. Thus the moisture given off inside by human beings, cooking, the photographic laboratory and in other ways would condense on the inner surface of the steel wall and freeze, producing, by the end of a year, a deposit of several tons of snow and ice. The problem was similar to that of a steel ship in the Arctic, and a visit was therefore paid to the British naval base at Rosyth, where research was being carried on on this problem. The destructive effect of frost on various insulating materials permeable to water vapour was noted, in particular sprayed asbestos and glass wool. A vapour barrier can be sprayed on the inner surface of the steel which will greatly diminish the amount of condensation, though not entirely preventing it. Trials show that, under average conditions on board ship, about 2 kg. per sq.m. of ice from condensation would form every 3 months. Although this quantity of ice would make the insulating

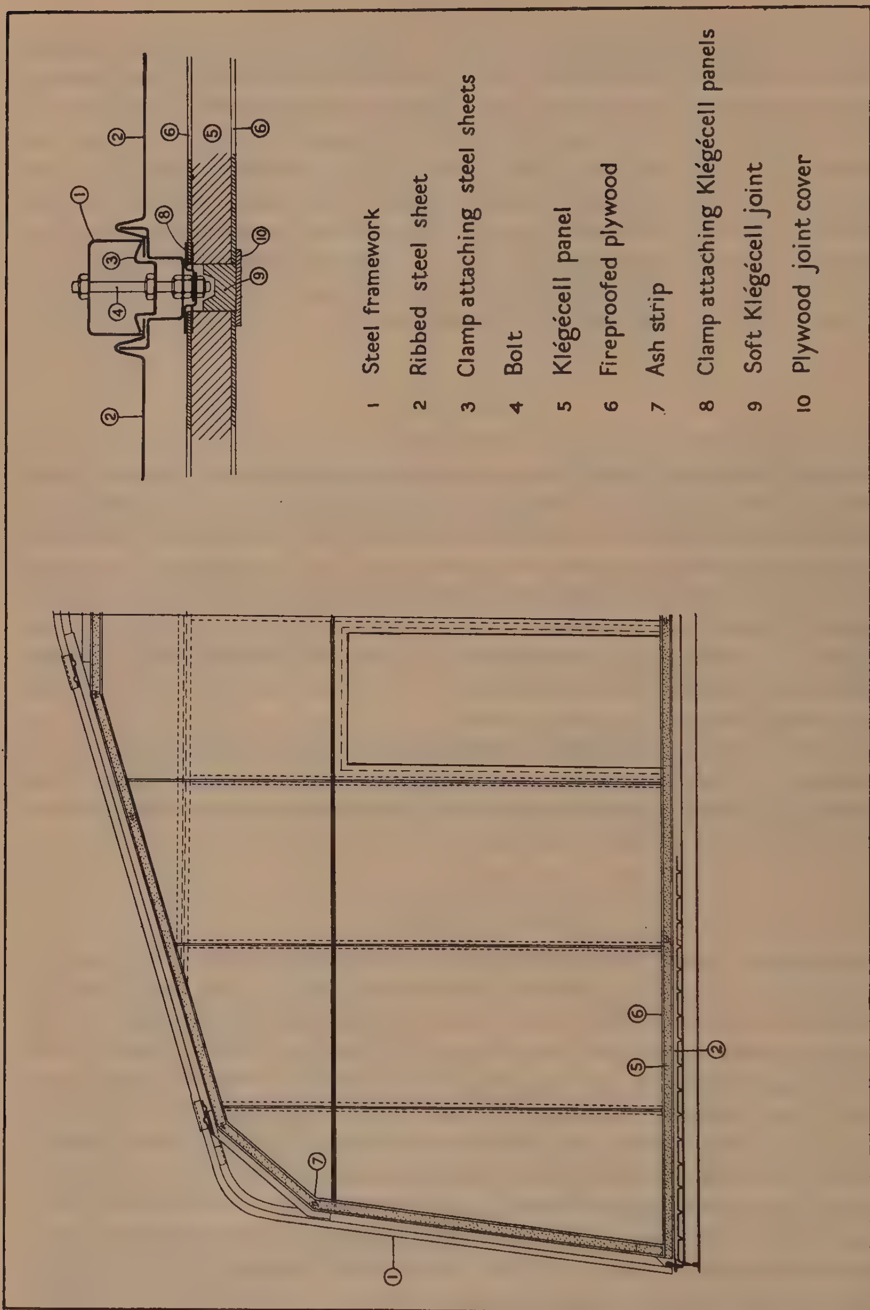

1 Steel framework
2 Ribbed steel sheet
3 Clamp attaching steel sheets
4 Bolt
5 Klégécell panel
6 Fireproofed plywood
7 Ash strip
8 Clamp attaching Klégécell panels
9 Soft Klégécell joint
10 Plywood joint cover

Fig. 1

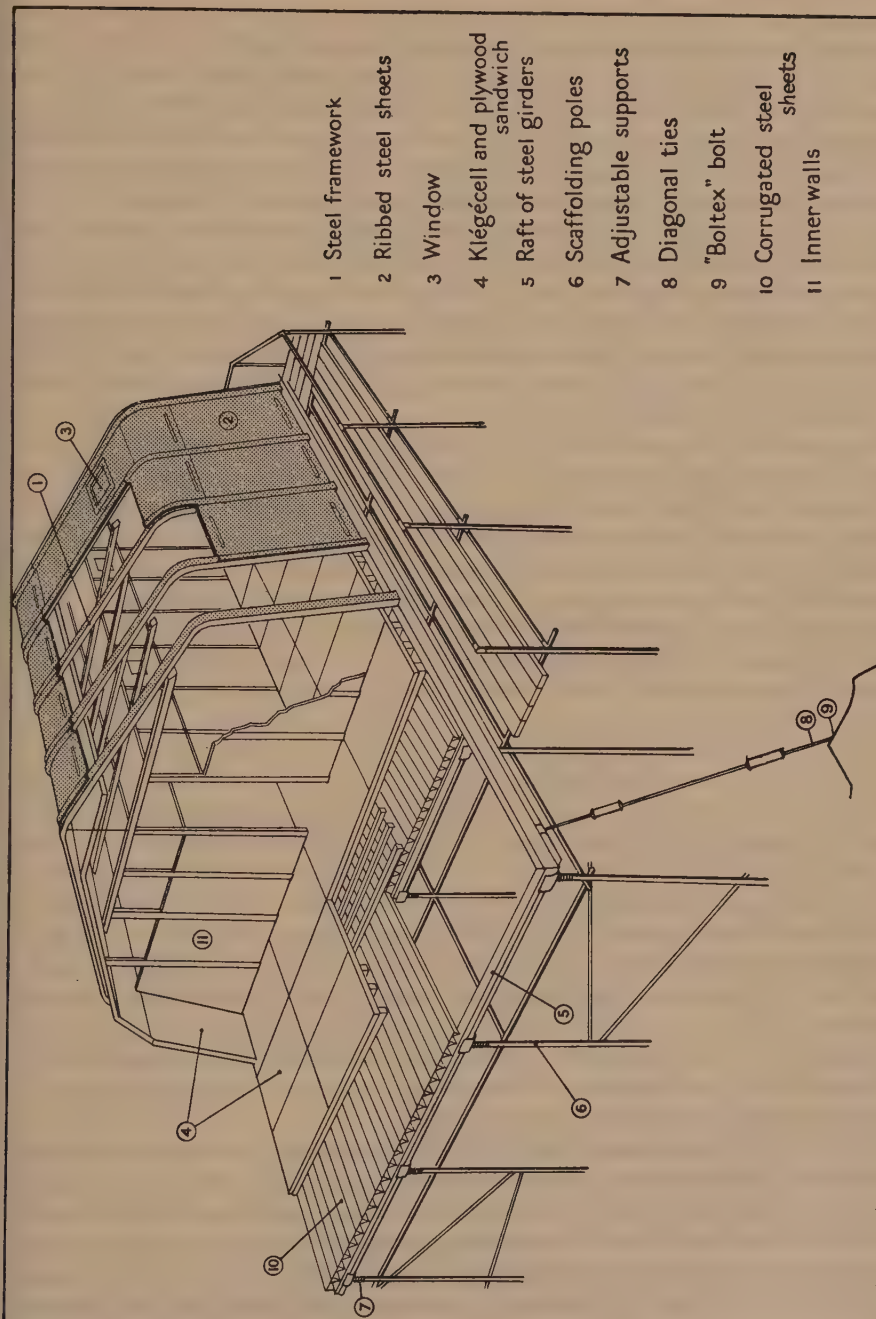

1 Steel framework
2 Ribbed steel sheets
3 Window
4 Klégécell and plywood sandwich
5 Raft of steel girders
6 Scaffolding poles
7 Adjustable supports
8 Diagonal ties
9 "Boltex" bolt
10 Corrugated steel sheets
11 Inner walls

Fig. 2

material lose about 30 per cent of its efficiency it would be tolerable in Arctic regions where positive temperatures are met for some months in the year. Provided that the warm period is long enough to enable all the ice to melt, the water can be drained away completely before the next winter begins. In the Antarctic, however, where the temperature is only positive for a few days in the year, other means had to be found to solve the problem. On the advice of R. Cadiergues, a heating engineer, it was decided to use an insulating material known as "Klégécell", which is completely impermeable to vapour. An air space was left between the insulating material and the metal wall (see Fig. 2). This was to control the formation of snow formed by the condensation of moisture which escaped through the joints of the insulating panels. This snow has the advantage of increasing, through its own properties, the thermal insulation of the building from 10 to 20 per cent. The snow should be removed every year and forms only about one-tenth of the amount which would form without the use of "Klégécell".

The panels of "Klégécell" (see Fig. 1), 50 mm. thick, are sandwiched between sheets of fireproofed plywood 5 mm. thick. The sheets themselves are joined by a strip of ash fitted into grooves cut in the "Klégécell". The erection and fitting of the panels on to the steel shell is done on the inside by means of metal clamps holding the exterior of the plywood; all thermal bridging is thus eliminated. As the panels have a standard length of 1 m. and the metal bays are 1·05 m., the difference is made up by a joint of soft "Klégécell" and a plywood joint cover. The exceptional rigidity and strength of the "Klégécell sandwich" are also made use of to cover the steel floor.

Heating and ventilation

The workshop is kept warm by the loss of heat from the generators, which work continuously. Only the living hut with an area of 200 sq.m. requires heating. The coefficient of transmission, K, of the wall expressed in kilocalories per hour, sq.m. and degrees centigrade, is between 5 and 6. The total surface of walls and floors is 600 sq.m. With a normal rate of renewal of air of 1 volume per hour, a heat loss of 400 calories per hour and per degree centigrade must be expected. Heating of the living hut and cooking are done with the same oil fuel as is used in the generators. This fuel possesses greater heating powers than anthracite. About 15 tons of oil fuel are sufficient for all purposes in the two buildings, while about 20 tons of anthracite would be required to produce the same amount of heat.

An air conditioning system was installed to maintain an even temperature throughout the hut and to prevent condensation on the walls. An oil-driven generator forces warm air into the upper part of a passage running the length of the building. The ceiling of the passage is insulated with glass wool forming a reservoir of warm air about 50 cm. deep. Silent ventilators in the wall of each room draw in this air at a speed of 2 to 3 m. per sec. and it returns through the curtains covering the doorways. The air in the building is thus circulated ten times an hour, with the consumption of only 200 W. of electricity. The

air-conditioning system normally works by means of a forced draught, but a more simple means of control had to be invented for use both in the emergency of an electricity failure and on the inland station. For, while there the violent winds of Terre Adélie create draughts capable of reaching 15 to 20 mm. C.E. in a normal chimney, the oil stove will only work satisfactorily with a regular draught of 1·5 mm. C.E. The firm of Gerard-Becuwe, using an experimental chimney belonging to the Shell Company, produced a system, consisting of a venturin and three valve regulators which insures the required draught even in the most violent winds. The chimney is carefully insulated to prevent condensation at the escape point of the burning gases. Following a suggestion by J. K. G. Borcherds,[4] an outer cylinder in the chimney is used to remove stale air by means of the natural draught created by the heat of the stove. Ventilation, however, can take place equally well by means of electric blowers connecting with the two air shafts which force inside air into circulation.

Arrangement of rooms

In arranging rooms consideration was given both to the requirements of each, and to the general convenience and comfort of the party. For example, rooms which require water, such as the kitchen, bathroom and darkroom, have to be grouped near a door to facilitate the bringing in of snow and the removal of dirty water. The radio and the meteorological rooms are noisy and should be kept apart from others; they are to be isolated with panels of polyester. All internal walls are 2 m. high which allows the spread of heat and light but also, unfortunately, noise. Beyond these is the living room, in the centre of the building. Then come the sleeping rooms, with two or four beds, separating the research rooms. This arrangment is to reduce to a minimum the interference of transmitting apparatus with delicate receiving apparatus.

Doors and windows

At each end of the building is a stable-type door to allow exit from the upper part when the lower part is blocked with snow. The doors are made of layers of light alloy and fitted into a rubber surround by means of clamps, in the manner of a refrigerator door.

The windows are mostly in the roof as this will rarely be covered with snow owing to strong winds; it has also been proved that this type of lighting is three times as effective as that coming from lateral openings. The windows are fixed portholes, 0·5 m. by 0·5 m. and twenty-four in number one for each bay, on alternate north and south sides. They are made of "Thermopane" which consists of three thicknesses of glass between which are sealed spaces of dry air. The coefficient of transmission of heat –K– for this combination is $K2$, while that of a single pane is $K5$. As internal condensation cannot take place they remain transparent throughout the winter, and can be used for the observation of weather and aurora.

Erection

The weight of the various parts of the huts is as follows:

Section	Weight (kg/sq.m. covered)
Tubular scaffolding (about 1 m. high)	15
Supporting raft	15
Floor (corrugated steel or wooden beams)	12·5
Fillod building	55
Thermal insulating materials (walls and floor)	25·5
Total	123 kg.

The workshop covers an area of 100 sq.m. and the living quarters 200 sq.m., making a total of 300 sq.m. produced from 36 tons of material. The ply-wood building first planned for Port-Martin covered 220 sq.m. and weighed 270 kg/sq.m. of enclosed space. The base hut of the British North Greenland Expedition covered 160 sq.m. and weighed 150 kg./sq.m. enclosed.

During the U.S. Navy trials it was found that a team of six men with some training could erect a Fillod building of 100 sq.m. on an existing foundation, in 100 man hours. In Terre Adélie, of course, conditions are very much more difficult, and it is calculated that it will take about twice as long.

References

[1] Vallette, Y. *and* Dubois, J. *Terre Adélie 1950–1952*. Constructions. Paris, Expéditions Polaires Françaises, 1955.

[2] Dykins, J. E. *Evaluation of 21 ft. by 52 ft. prefabricated steel, sloping sidewall, gable roof barracks building; one metropolitan type and one tropical type; manufactured by Constructions Metalliques Fillod, Paris, France.* United States Naval Civil Engineering and Research Laboratory, Port Hueneme, California, 5 March 1954.

[3] Myers, F. W. Arctic regions pose tough metallurgical problems. *Iron Age*, Vol. 175, No. 3, 1955, p. 79–82.

[4] Borcherds, J. K. G. "A research station or expedition base in Antarctica." An unpublished thesis for the degree of Bachelor of Architecture, University of Cape Town 1951. (Scott Polar Research Institute MS. 119.)

Detailed drawings of these buildings have been deposited at the Scott Polar Research Institute, MS. 326/1–8.

Building metal hut at Ile des Pétrels, Terre Adélie, January, 1956

Photograph B. Imbert

(*Facing p.* 252)

Calanus in Frobisher Bay (see p. 254–55)

Photograph by M. J. Dunbar

Weasels and sledges in Prince Charles Mountains, Mac-Robertson Land, 1955 (see p. 258–59)

A.N.A.R.E. photograph

FIELD WORK

TRANS-ARCTIC COMMERCIAL FLIGHTS, 1952, 1953 AND 1954

[Summarized from *Polarboken*, 1954, p. 71–96. Accounts of these flights published in the *Polar Record*, Vol. 7, No. 48, 1954, p. 207–209, and No. 50, 1955, p. 418–19 contain inaccuracies. The facts summarized below are from an article by Einar Sverre Pedersen, who served as a navigator in all the experimental flights.]

The first trial flights by commercial aircraft across arctic regions to America and Japan were made by Douglas DC-6B aircraft belonging to Scandinavian Airlines System.

On 19–20 November 1952 the *Arild Viking* flew from Los Angeles to Copenhagen with stops at Edmonton and Thule. The flying time was 24 hr. 7 min.

On 5–6 December 1952 a flight was made by the *Hjalmar Viking* from Los Angeles to Oslo with a stop at Thule. The flying time was 21 hr. 10 min.

Starting on 23 May 1953, a flight was made by *Hjalmar Viking* from Oslo to Tokyo. Stops were made at Thule, Anchorage (overnight) and Shemya Island in the Aleutians. The flying time was 34 hr. 53 min. The return journey to Stockholm, by way of Bangkok and Rome, took 46 hr. 49 min. flying time.

The *Gorm Viking* flew from Los Angeles to Stockholm on 22–25 January 1954 in 24 hr. 13 min. flying time. Stops were made at Calgary, Edmonton (for 24 hr.), Churchill, Frobisher Bay, and Bluie West Eight (Søndre Strømfjord) in west Greenland.

Another flight was made by the *Leif Viking* from Oslo to Tokyo, starting on 24 May 1954. Stops were made at Bodø, Fairbanks (overnight) and Shemya Island, passing over Svalbard and the North Pole. The flying time was 33 hr. 55 min. On the return flight landings were made at Adak, in the Aleutians, Cold Bay, Anchorage (overnight), Big Delta and Fairbanks. From Fairbanks the aircraft flew to Stockholm without stopping in 14 hr. 37 min.

Regular commercial flights between Los Angeles and Copenhagen began on 15 November 1954.

BRITISH UNIVERSITY EXPEDITIONS, 1955

Cambridge Spitsbergen Physiological Expedition, 1955

[Summarized from information provided by Mary C. Lobban. A note on the previous expedition, in 1953, appeared in the *Polar Record*, Vol. 7, No. 48, 1954, p. 151.]

The object of this expedition was to continue the work started in Spitsbergen in 1953 on excretory rhythms in human subjects living an abnormal time routine. Members were:

Mary C. Lobban, Leader
H. Barber
A. E. Booth
Clare G. Bradley
P. F. Friend
Janet A. Green
A. L. Hovenden
B. Moore
Barbara A. Noddle
A. F. Rogers
Ann M. Savours
P. Shipp
A. M. Ward
A. C. J. Wells

An advance party, consisting of Lobban, Barber, Savours and Shipp, left England at the end of May to set up the laboratory and main base at Brucebyen, on Billefjorden. Ice in the fjord was unusually late in breaking up and the party had to man-haul all stores and equipment for the last 8 miles.

The main party reached Brucebyen on 27 June and found the fjord still full of rotten ice. Wells, who had been acting as courier to the main party, and Barber then returned to England.

Lobban, Booth, Bradley, Savours, Shipp and Ward remained at Brucebyen and lived a 21-hour day. Friend, Green, Moore and Noddle set up a subsidiary base at Ebbadalen, where they lived a 27-hour day. A considerable amount of chemical analysis of urine samples was carried out and small quantities of each of about 3000 samples were brought back for further analysis. A much tighter routine was observed than in 1953, so that results are more complete and statistical treatment of them will be possible. More work was carried out at the base, and the experiment was extended to include the recording of body temperatures.

In mid-July Hovenden and Rogers joined the Ebbadalen and the Brucebyen parties respectively, while Savours and Shipp returned home. The two parties re-united at Brucebyen on 24 August and returned to Longyearbyen on *Nordsyssel*, and thence to England.

Although neither chemical nor mathematical analyses are completed, it is already obvious that a far clearer picture of the relationship between physiological rhythms and environmental time in the human subject will be available than existed previously. It appears that, although rapid and complete adaptation of the excretory rhythms to the abnormal time-scale was comparatively uncommon, in nearly all cases the adaptation of the body temperature rhythm was complete. Interesting examples were also obtained of the way in which the stresses of cold and exercise broke down adaptation to abnormal environmental time.

Durham Expedition to Svartisen, 1955

[Summarized from a note by B. Kelk. A note on an expedition to Svartisen in 1950 appeared in the *Polar Record*, Vol. 6, No. 43, 1952, p. 380.]

The object of this expedition was to continue the survey of the Svartisen area, about 250 miles north of Trondheim, begun in 1950, and to include the intake area of Engenbreen.

Members of the party were W. S. Moffat, leader and meteorologist, K. Bramley, glaciologist, D. Graham, botanist, B. Kelk, surveyor, D. B. Orr, geologist, M. E. Phillips, surveyor, A. A. Sharing, glaciologist and E. Vinsome, zoologist.

The party travelled from Bergen by coastal steamer to Ørnes, and by fishing vessel to Holandsfjorden. Bad weather prevented the survey of Engenbreen so survey and glaciological work was carried out on Lillebreen, and botanical and zoological specimens collected. A bathymetric survey of Svartisvatn was made on a scale of 1:10,000.

The party arrived back in England on 12 September, having left on 29 June.

FISHERIES RESEARCH IN HUDSON BAY: *CALANUS* EXPEDITIONS, 1955

[Summarized from information provided by M. J. Dunbar. Previous reports on the work of the *Calanus* were published in the *Polar Record*, Vol. 6, No. 41, 1951, p. 92–95 and 113–14; Vol. 7, No. 47, 1954, p. 39–40; No. 48, 1954, p. 145, and No. 50, 1955, p. 393.]

Calanus, Captain H. N. Andersen, left Montreal at the end of June 1955 with E. H. Grainger, in charge of scientific investigations, I. A. McLaren, F. W. Black and T. E. Wilson. The ship was delayed by ice conditions off the Labrador coast, and the opportunity was taken to investigate plankton production and cod at Nain. The

work planned for the season in the south-eastern part of Hudson Bay had to be abandoned owing to this delay. At Coral Harbour Arthur Mansfield joined the ship; he had been studying walrus in the area since March. The previous year's work on Atlantic Walrus (*Odobaenus rosmarus*) was resumed at Coats Island. During the season forty-eight walrus were tagged with a new type of stainless steel tag designed by Dunbar. Wilson left by air early in September. Mansfield continued his investigations by accompanying an Eskimo hunting party to Seahorse Point, returning to Montreal in October.

The remaining four members of the party took *Calanus* through Roes Welcome Sound and Frozen Strait to Igloolik in October. There the ship was frozen in for the winter as had been planned. Black and McLaren then returned to Montreal, leaving Grainger and Andersen on board as a wintering party. A post was established at a hole in the ice through which the winter régime of plankton and benthos could be observed in some 50 m. of water. Work was also done on the walrus and Ringed Seal (*Phoca hispida*), northern Foxe Basin being one of the few places where walrus are known to winter.

During the summer David Sergeant studied Beluga (*Delphinapterus leucas*) in the Churchill area, where a commercial company held a licence to catch a limited number. Material from 200 White Whales was collected. During an air reconnaissance on 25 July 2700 whales were counted, 900 in Churchill River estuary and 1800 near the mouth of Seal River. By 30 August all whales had left the area, presumably on migration.

Arctic Unit of Fisheries Research Board of Canada

Since 1947 Dunbar has been in charge on a part-time basis of the fisheries investigations carried out in the eastern Arctic on behalf of the Fisheries Research Board of Canada. By 1954, however, the work had expanded so much that full-time control was essential, and during 1955 the Arctic Unit was established with the following full-time staff:

H. D. Fisher, in charge
Miss B. M. Barry
A. S. Bursa
E. H. Grainger
J. G. Hunter
I. A. McLaren
A. W. Mansfield
D. E. Sergeant

Dunbar remains as consultant and adviser. Andersen is skipper of *Calanus*, and general technical assistant.

U.S. OPERATION "SOUTHWIND', 1955

[Summarized from a report by the U.S. Office of Information Services, Thule Air Base, Greenland.]

This operation was carried out by the Arctic Group of the Transportation Corps, U.S. Army, from the base at Thule, North-west Greenland. The object was to deliver cargo by means of mechanized vehicles to a remote destination on the ice-sheet during winter darkness. The party was commanded by Colonel Page H. Slaughter and consisted of thirty-one men; four officers and non-commissioned officers, one medical officer, two radio operators, two cooks, two mechanics, three navigators and and seventeen drivers. The equipment comprised five tracked heavy tractors, four fuel transporters (tanks mounted on sledges), three personnel and one supply wanigans (heated shelters mounted on sledges), eleven cargo and one service sledge, and three weasels. Supplies of food and fuel for 60 days were carried.

The operation began on 18 October when the train left "Tuto", a semi-permanent camp established in 1955 on the edge of the ice sheet, about 14 miles from Thule. The

route was towards the east for about 200 miles to an air weather station called "Site Two", and then it headed south. On 7 November the destination was reached, 660 miles from "Tuto", and the stores delivered. On the return journey the party was stormbound for 5 days and had to abandon some equipment owing to shortage of fuel. Before reaching "Tuto" news was received that another party was stormbound about 140 miles east of the camp, and so a deviation was made to locate and help it. "Tuto" was finally reached on 29 December.

During this operation in darkness three airdrops were carried out by SA-16 aircraft of the 55th Air Rescue Squadron at 330, 500 and 270 miles from Thule.

SOUTH AFRICAN EXPEDITION TO BOUVETØYA, 1955

[Summarized from the *Cape Times* of 30 October 1954, and 25 January, 7 February and 1 March 1955, from a note by L. Q. Hayward, and information from Allan B. Crawford.]

An expedition, commanded by Captain P. Dryden-Dymond, S.A.N., and under the auspices of the South African Weather Bureau, left Cape Town on 25 January 1955 in the frigate *Transvaal* for Bouvetøya. This island, which is under Norwegian sovereignty, is about 1600 miles (2574 km.) south-south-west of Cape Town, in lat. 54° 26′ S., long. 3° 24′ E, and is the most isolated island in the world.

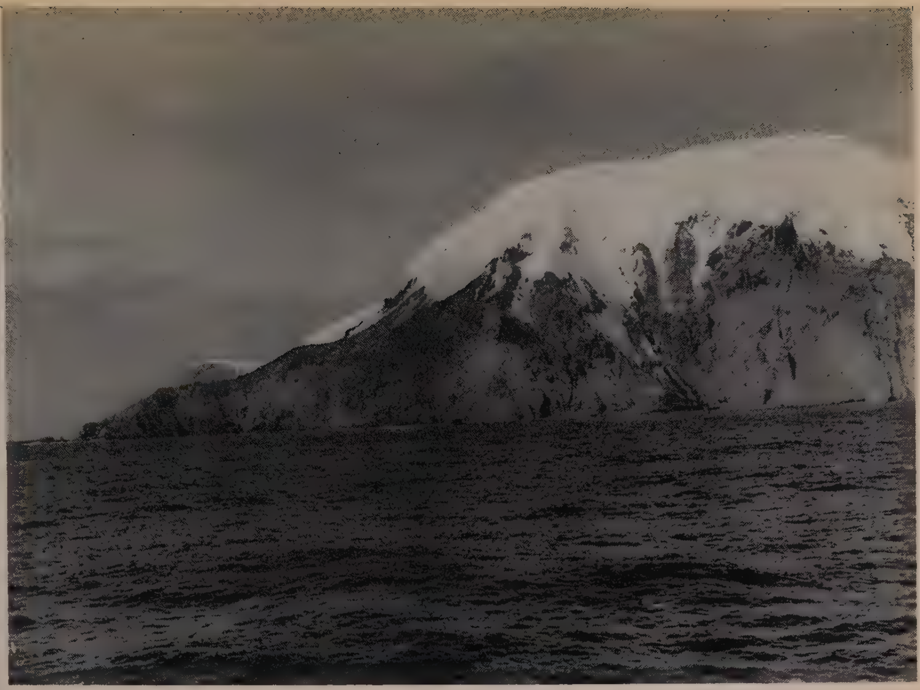
The object of the expedition was to investigate the possibility of establishing a meteorological station on the island as part of South Africa's contribution to the International Geophysical Year, 1957–58. The particular importance of Bouvetøya in this connexion lies in its central position in a vast area of the Southern Ocean. In addition, it is close to one of the standard meridians, that of 10° E., chosen for study during the International Geophysical Year.

The island consists of a single volcanic cone with a wide indented crater rising to small peaks on opposite sides, the higher one, in the north-east, reaching a height of 3070 ft. (936 m.). The slopes of the cone terminate on all sides in precipitous cliffs and glaciers descending abruptly to sea-level. Records of previous expeditions, all of which have taken place in the summer, show that ice conditions differ considerably on and around the island from year to year.

In December 1927 a Norwegian party landed on Bouvetøya and claimed it as a Norwegian possession. A depot hut was built near Kapp Norvegia. A year later a party returned to set up a meteorological station and discovered that the hut had been completely destroyed by gales. In 1929 the *Norvegia* expedition erected a solidly built depot hut at Kapp Circoncision, shored up and strengthened against gales, and left there stores and emergency equipment. A year later this building too had completely disappeared. Another hut, built on Larsøya in 1929, had likewise disappeared by 1931.

Members of the reconnaissance party of the South African expedition were Stewart Solomon, civil engineer, L. Q. Hayward, senior meteorologist, A. J. Smith and A. B. Crawford, meteorologists, and A. K. Armour, S.A.A.F., photographer.

Bouvetøya was sighted on 30 January. No ice was met during the voyage or around the island, and the lower rocks of the various capes were also free of ice and snow; this was in marked contrast to conditions experienced by earlier Norwegian expeditions. Sea swells made landing impossible that day so the *Transvaal* sailed slowly round the island viewing bays along the coast. During this trip the radar display picture was photographed at regular intervals as part of the survey of the island. It was clear that only three sites warranted serious investigation. These were (*a*) Kapp Norvegia, (*b*) the snow or ice slopes east of the top point of the island, at a height of 800–1200 ft. (244 to 366 m.), and (*c*) on the mainland part of Kapp



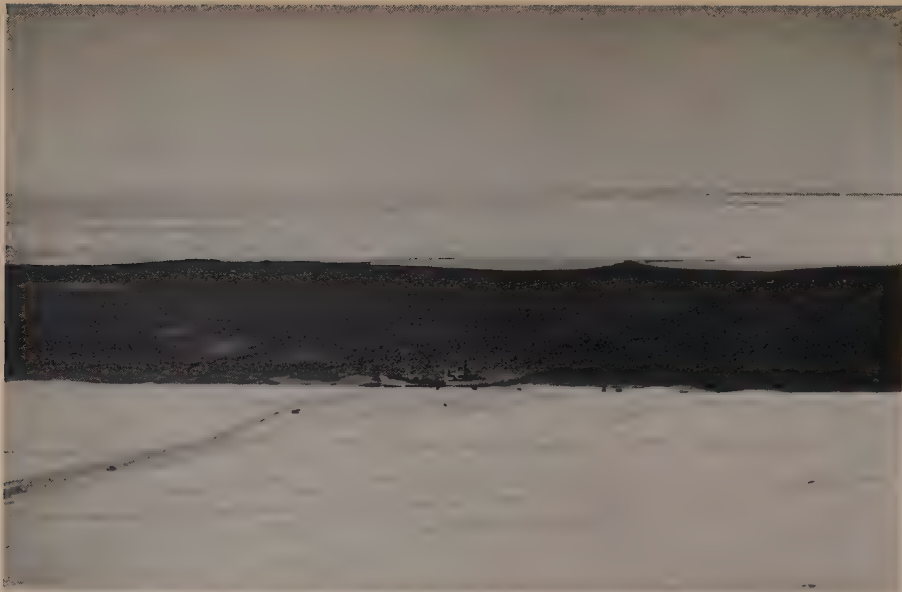
Kapp Circoncision, Bouvetøya, from south-west

East coast, Bouvetøya

South African Expedition to Bouvetøya, 1955

Photographs by L. Q. Hayward

(*Facing p.* 256)



Theron at the edge of the fast ice, with encroaching pack ice beyond

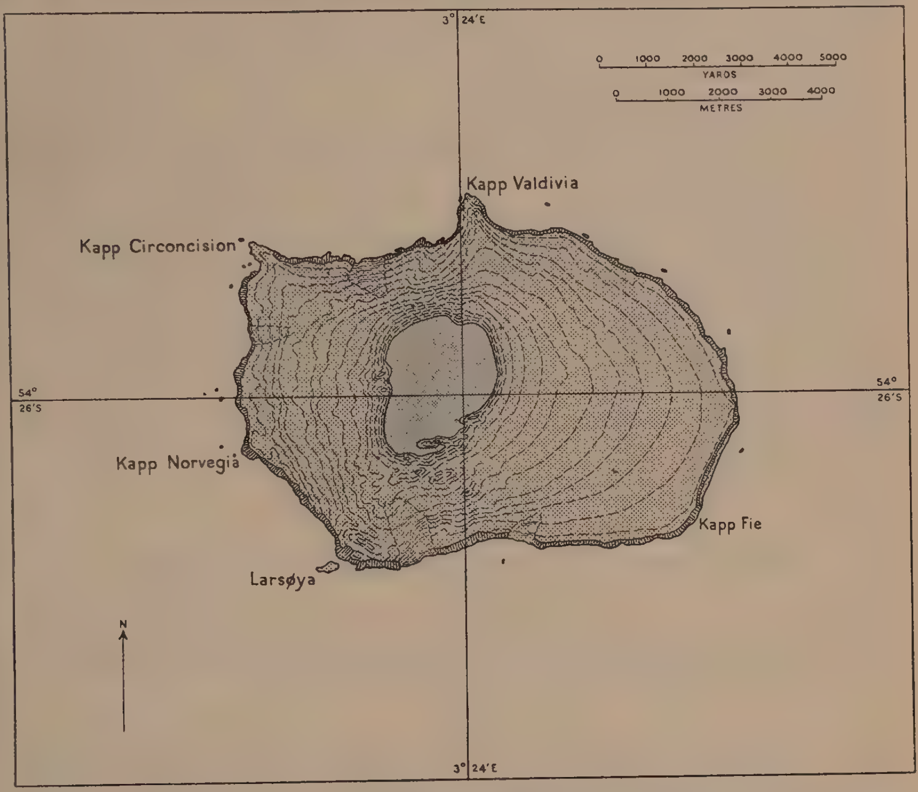
Theron unloading at the ice edge, "Shackleton"

Trans-Antarctic Expedition, 1955–56 (see p. 264–67)

Photographs by Trans-Antarctic Expedition

Circoncision at a height of about 130 ft. (40 m.), where a site for huts would have to be benched out.

On 31 January the *Transvaal* anchored off Kapp Norvegia and the coast and Larsøya were inspected through field-glasses. The cape was seen to be very narrow and a hut built on it would be threatened both by ice falls from the glacier cliffs above, and by sea water thrown up by ice falls. Some rounds of 4 in. shells were fired into



Bouvetøya

Based on South African Hydrographic Office chart No. S.A. 1, 1 April 1956. Produced from photographs of the P.P.I. of the Type 974 Radar fitted aboard the South African Navy frigate *Transvaal*.

the cliffs along the south-east coast to test the stability of the ice, and these caused no more than showers of snow and splinters. This was surprising as ice falls occurred all the time the ship was off the island; they were particularly common in the area around Kapp Valdivia. In addition to other disadvantages the whole coast was open to prevailing westerly swells, also radio communication with both South Africa and Tristan da Cunha would have been poor, or even impossible. The search for a base along the west coast was therefore abandoned.

Next morning a landing was made on a narrow, black and sandy beach about a mile north of Kapp Fie. The cliffs, 200 ft. (60 m.) high and overhanging in places, with deep crevasses, were examined during a short stay. The rest of the day was spent in completing a running survey of the island and photographing the coast in ideal weather conditions. Unfortunately the ship's echo sounding gear became

unserviceable soon after arriving at Bouvetøya so the programme of sounding could not be carried out. In the afternoon a party in a whale boat examined Kapp Circoncision and the next morning, 2 February, a landing was made. This took place on the east side of the cape and the party spent several hours investigating the area. The most promising site was on the promontory above the almost vertical cliff face. The clearing of about 3000 cu.yd. of rock here would provide a reasonable site for a station. Unfortunately the slope was extremely steep and covered with refuse from a vast penguin rookery, and Solomon could only reach a point about 100 ft. (30 m.) up. An attempt to hoist a meteorological screen to a higher point where it could be left as a test was also unsuccessful. The same day *Transvaal* left Bouvetøya and on 6 February arrived back at Cape Town.

During the expedition a programme of meteorological work was carried out, with full synoptic observations six times daily. Sea temperature at the island varied between 33 and 38° F., and air temperature between −12° and 39° F.

It is considered possible to erect and maintain a meteorological station on Bouvetøya. Choice of sites is between the headland position of Kapp Circoncision and the eastern ice plateau. The disadvantages of Kapp Circoncision are the difficulties of benching the site and the haulage of supplies up the slope, also a doubtful fresh water supply. A satisfactory small landing jetty could be constructed, but landings would always be jeopardized by the condition of the sea. The plateau site would depend entirely on support by helicopter but this, if based on a ship in the lee of the island, would be less dependent on weather conditions. On the whole the Kapp Circoncision site was considered the more promising. As the survey had been made in unusually good summer weather it was realized that a winter inspection was necessary before a final choice could be made.

The South African Government, however, later decided not to proceed with the project.

AUSTRALIAN NATIONAL ANTARCTIC RESEARCH EXPEDITION 1955–56

[By P. G. Law. Previous accounts of the expenditions were given in the *Polar Record*, Vol. 5, Nos. 37/38, 1949, p. 317–23; Vol. 6, No. 41, 1951, p. 80–84; No. 45, 1953, p. 667–69; Vol. 7, No. 50, 1955, p. 400–02 and No. 51, 1955, p. 497–98.]

Mawson

The Mawson station has now been firmly established as an observatory. During 1955 synoptic meteorological observations (including radiosonde) and continuous cosmic ray, geomagnetic and auroral records were obtained. This programme has been expanded by the addition in 1956 of seismographs and a "rawin" radiotheodolite for upper wind measurements. Field work comprises geology, glaciology and marine biology. The station in 1956 consists of twenty-five huts and a large aircraft hangar which houses a "Beaver" and an "Auster" aircraft.

Five main journeys were made from Mawson during the season 1955–56, whilst the establishment and maintenance of automatic meteorological stations at Mount Henderson (10 miles inland) and "Ytterskjera" (an island 6 miles off-shore) involved several hundred miles travel with weasels or dogs throughout the year.

On 15 August J. M. Bechervaise, P. Crohn, L. Fox, R. H. Lacey, E. Macklin and H. Oldham left Mawson with two dog teams to visit the Bretangen Emperor Penguin rookery, lat. 67° 27′ S., long. 60° 52′ E., which had been discovered in the previous year by R. Dovers. It was visited a second time between 24 and 28 September by R. W. Allison, A. Gowlett, R. D. McNair, H. Oldham, P. Shaw and J. Ward.

The first southern journey began on 1 November. Bechervaise, Crohn, Fox, Gowlett, Lacey, McNair and N. R. Parsons left in two weasels to lay a depot approximately 100 miles inland. The party returned on 9 November, and the second phase

began on 14 November, with Bechervaise, Crohn, Gowlett, Lacey, Macklin, Riddell and Shaw.

The first depot was established in lat. 69° 02′ S. long. 64° 34′ E. close to "Dovers' Depot" peak. The party pushed on beyond Dovers' furthest south, laying a further depot in the Prince Charles Mountains. Salient peaks were visited for the first time, mapped and named. This 200-mile depot is situated in lat. 70° 09′ S., long. 64° 47′ E. Geological and survey work was carried out throughout the journey. One of the weasels had to be abandoned 150 miles from Mawson, which was not reached until 7 December.

Between 11 and 18 January a party consisting of Bechervaise, Crohn, Elliott, Parsons and Ward made the first visit to the David, Masson and Casey Ranges, in lat. 67° 40′ to 68° S., long. 62° to 63° E. which were named from the sea by Sir Douglas Mawson in 1930. Several peaks were climbed and geological observations made.

The relief expedition to Mawson, January–March 1956, carried out extensive exploration of the unknown Wilkes Coast. Led by P. G. Law, Director of the Antarctic Division, the expedition sailed south from Melbourne in the *Kista Dan* on 27 December, aiming to strike the Antarctic continent just west of Terre Adélie.

For a period of 6 weeks the ship cruised along the Antarctic coast and Law and his men made landings at four places: an islet in Davis Bay (lat. 66° 06′ S., long. 134° 22′ E.), one of the Balaena Islets (lat. 66° 01′ S., long. 111° 07′ E.), an islet off the coast north-west of the Windmill Islands (lat. 66° 14′ S., long. 110° 11′ E.) and one of the Windmill Islands (approximately lat. 66° 22′ S., long. 110° 30′ E.). At each place scientific observations were carried out and aircraft flights were made to photograph the coastline. Soundings were taken throughout the Antarctic part of the voyage.

On 30 January *Kista Dan* arrived off Haswell Island and remained there for 2 days. The Soviet ship *Ob'* was visited, also the Soviet International Geophysical Year station at "Mirnyy".

Kista Dan reached Mawson on 17 February and remained for 17 days while the annual relief took place.

The members of the wintering party in 1956 are:

W. G. Bewsher, Officer-in-Charge
G. L. Abbs, Radio operator
P. N. Albion, Radio operator
J. S. Bunt, Biologist
M. V. Christensen, Weather observer
Cpl. N. M. Cooper, Mechanic
P. W. Crohn, Geologist
D. A. Dowie, Medical officer
L. G. Gardner, Diesel mechanic
J. Hollingshead, Radio supervisor
R. M. Jacklyn, Cosmic ray physicist
Sgt. G. Johansson, Engine fitter
S. L. Kirkby, Surveyor
S/Leader D. W. Leckie, Pilot
N. T. Lied, Weather observer
J. W. P. McCarthy, Meteorologist
P. M. McGregor, Geophysicist
J. A. McKenzie, Cook
F/Sgt. J. Seaton, Pilot
Sgt. G. Sundberg, Airframe fitter

Macquarie Island

The annual relief at Macquarie Island was carried out in 5 days, from 11 to 16 December 1955, under the direction of J. Donovan.

The members of the wintering party in 1956 are:

I. L. Adams, Officer-in-charge
D. A. Brown, Radio operator
K. D. Cole, Physicist (Aurora)
B. Cook, Geophysicist
W. R. J. Dingle, Weather observer
R. L. Dowden, Radiophysicist
I. A. Fox, Weather observer
R. M. Hughes, Medical officer
K. Keith, Biologist
G. J. MacDonald, Weather observer
Sgt. J. B. Morgan, Cook
H. L. Price, Engineer
J. M. Scott, Radio operator
P. A. Trost, Physicist (Cosray)
D. R. Twigg, Radio supervisor

THE FALKLAND ISLANDS DEPENDENCIES SURVEY, 1954–55

[Summarized from information provided by the Colonial Office. Accounts of F.I.D.S. activities in 1950–54, and of the Falkland Islands and Dependencies Meteorological Service, were published in the *Polar Record*, Vol. 7, No. 48, 1954, p. 166–73; No. 51, 1955, p. 521–22, and Vol. 8, No. 52, 1956, p. 29–32.]

Relief of F.I.D.S. stations, 1954–55. The R.R.S. *John Biscoe*, Captain W. Johnston, left Southampton on 4 October 1954, carrying relief parties, stores and equipment. She arrived at Port Stanley, Falkland Islands, on 3 November, and left on her first southern voyage on the 11th with the Governor of the Falkland Islands and Dependencies on board. The Admiralty Bay station was relieved on the 14th and Hope Bay on the 19th after a voyage in which the vessel had to rely entirely on radar owing to thick fog. At Hope Bay stores, mail, and a number of dogs brought from Canada and Greenland were unloaded, and a survey and geological party embarked. This party, which consisted of R. J. F. Taylor, N. A. G. Leppard, A. F. Lewis, and A. J. Standring, was bound for Anvers Island to reconnoitre a site for a new station there. The *John Biscoe* left Hope Bay on 23 November and reached Deception Island the same day. On the 24th the Governor transferred to H.M.S. *Veryan Bay*. The *John Biscoe* left again on the 27th and reached Port Lockroy on the 28th. On 1 December the survey and geological party from Hope Bay was landed from the *John Biscoe* on the east side of Biscoe Bay, Anvers Island. Heavy ice had prevented the ship from reaching Cape Monaco, farther to the west, as had been planned. The reconnaissance party reported that the crevassed terrain made access to the interior of the island from this bay impossible. It was then decided to postpone the search for a site, and the vessel returned to Port Lockroy. She left again on 3 December but did not reach the Argentine Islands until the 12th. This was the earliest date on which this station had ever been relieved. Close pack ice was encountered in Lemaire Channel and from 5 to 12 December the vessel had to push her way through fast ice. She was beset several times during the return passage to Deception Island between the 15th and 17th, and the ice prevented a further reconnaissance of Anvers Island. From Deception Island, the *John Biscoe* returned to Port Stanley.

Between 29 January and 9 February 1955 the *John Biscoe* visited the Signy Island station, where stores were unloaded and the foundations for a new hut laid. She also visited Grytviken, South Georgia, on 11 February on her way back to the Falklands.

Meanwhile, on 15 January, the *Norsel*, Captain O. Johannessen, left London for the Falkland Islands. She carried the personnel, stores and equipment for two new stations: one on Anvers Island and one in the Marguerite Bay area. She reached Port Stanley on 17 February and left again for Hope Bay to collect further stores on the 21st. On arrival at Anvers Island, a site in lat. 64° 45′ S., long. 64° 05′ W., between Biscoe Bay and Cape Monaco, was selected. On 28 February the wintering party of six men was landed and work began on the construction of the station. On 8 March the *Norsel* called at Port Lockroy, and then went south to Marguerite Bay. The existing station on Stonington Island, which had been evacuated in February 1950,[1] could not be reached because of ice, and a new site was chosen on Horseshoe Island in lat. 67° 49′ S., long. 67° 17′ W. The wintering party of eight men was landed on 11 March, and the ship remained until the 15th to help with the building of the station.

The third southern voyage of the *John Biscoe*, again with the Governor on board,

[1] See the *Polar Record*, Vol. 6, No. 41, 1951, p. 23.

Falkland Islands Dependencies Survey base at Hope Bay, Trinity Peninsula

F.I.D.S. photograph by B. Kemp

began on 28 February. Admiralty Bay was visited between 4 and 6 March and Port Lockroy on 7 and 8 March. The *John Biscoe* was at the Argentine Islands from 8 to 19 March, and helped the party on Anvers Island between the 19th and the 24th. At Deception Island, on 25 March, the Governor joined H.M.S. *Burghead Bay*, and the *John Biscoe* went on to Hope Bay on the 29th. Stores for the View Point hut were landed on Beak Island, in northern Crown Prince Gustav Channel. Admiralty Bay was visited on 7 to 8 April and Signy Island on the 10th. The *John Biscoe* then went into dry dock in South Georgia. Here it was found that her stern had suffered so much damage that, after temporary repairs, she returned to Port Stanley and left at once for the United Kingdom. She reached Southampton on 19 June.

Towards the end of March, the *Norsel* had completed her task of establishing the two new stations, and was able to spend nearly a month on survey work. K. V. Blaiklock, the F.I.D.S. liaison officer on the *Norsel*, was also a surveyor with 4 years' survey experience at Stonington Island and Hope Bay. Between 30 March and 4 April, he made a detailed survey of the Martin Islands anchorage, and, despite bad visibility, was able to make some observations on the west coast of the Biscoe Islands. Between 11 and 25 April a number of astro-fixes were observed in southern Gerlache Strait. These provided control for the running survey which was made at the same time and extended northwards as far as Hughes Bay. The *Norsel* returned to Port Stanley on 1 May, and sailed for the United Kingdom via South Georgia, on the 4th. She reached London on 11 June. Throughout her voyage ice conditions were extremely good. Apart from the ice in southern Marguerite Bay, she was able to carry out a very full programme unhampered by ice.

Movements of British naval vessels, 1954–55. H.M.S. *Veryan Bay*, Commander L. R. P. Lawford, R.N., left Port Stanley on 21 November 1954, and reached Deception Island on the 24th. Here the Governor joined the ship and remained aboard for the rest of the cruise. The Argentine station at Potter Cove, King George Island, and the F.I.D.S. station at Signy Island were visited and inspected, and on 30 November, the ship reached Grytviken, South Georgia. Between that date and 8 December, the whaling stations were visited, and the ship returned to Stanley on the 10th.

During January 1955, the *Veryan Bay* made a second voyage south, which included visits to Argentine and Chilean stations at Deception, Livingston, Greenwich, Robert and Nelson Islands in the South Shetland Islands.

After a further visit to South Georgia early in February, the *Veryan Bay* was relieved at Port Stanley by H.M.S. *Burghead Bay*.

Late in March the *Burghead Bay* went to Deception Island to collect the Governor who, until then, had been with the *John Biscoe* on her third southern voyage. On her return from Deception Island she visited the Potter Cove station and Signy Island. She reached Port Stanley on 4 April.

Biological work in South Georgia 1954–55. B. Stonehouse and W. N. Bonner continued their work in the Bay of Isles throughout 1954. This was concerned mainly with the behaviour of King and Gentoo Penguins (*Aptenodytes patagonica* and *Pygoscelis papua*) and with marine biology. During the latter half of December 1954 and in January 1955 Stonehouse worked on marine biology in the Grytviken area, while Bonner spent some time observing reindeer. They both left for the United Kingdom in February 1955.

Activities at F.I.D.S. stations, 1955. Routine meteorological observations were continued throughout the year from the seven occupied stations: Port Lockroy,

---

Falkland Islands Dependencies Survey base at Port Lockroy, Palmer Archipelago

F.I.D.S. photograph by A. H. Swain

Deception Island, Hope Bay, Argentine Islands, Admiralty Bay, Signy Island and Grytviken, South Georgia. Special weather forecasts for the whaling fleets were made from Grytviken between 10 October 1954 and 8 April 1955. Meteorological observations were also made at Horseshoe Island as soon as the station was completed. Routine ionospheric work was carried out at Port Lockroy.

Some biological work on Weddell Seals (*Leptonychotes weddelli*) was undertaken at Signy Island, and a limited programme of bird-ringing was carried out at several of the stations.

During the first part of the year, a number of short sledge journeys were made from Hope Bay for local survey, geological work and sealing, and the View Point hut was visited and occupied intermittently. The large-scale survey of the Hope Bay area, begun by R. R. Kenny in June 1954, was completed in June 1955. Between 7 June and 14 July, W. E. Anderson, Leppard, P. M. O. Massey and A. Precious made a depot-laying journey to Cape Longing. On 6 August, Anderson, Leppard, M. F. Tait and Taylor, supported in the early stages by D. R. Willis and R. F. Worswick, began the main survey journey of the year. They travelled by way of the Seal Nunataks, Evans Inlet and Cape Disappointment to the Churchill Peninsula area and penetrated some distance inland along Crane Glacier. The object of this journey was to re-survey the Seal Nunataks area and the coast between Cape Fairweather and Cape Alexander. The main course ran about 10 miles out on the ice shelf with three detours inland. Anderson and Tate attempted to ascend Crane Glacier but were defeated by rough pressure ice. Leppard and Taylor entered and surveyed Evans Inlet. Later the whole party went up "Richtofen Valley" but were unable to complete the survey owing to bad weather. Both Evans Inlet and "Richtofen Valley" contained a number of accessible nunataks. During this journey of 890 miles 4200 sq. miles were surveyed and Jason Island was discovered to be a peninsula. The party returned to Hope Bay on 27 October. In addition to these journeys five others of over 100 miles each were made between June and November, including the first crossing of James Ross Island, by D. A. Clarke and A. F. Lewis.

During the winter several visits were paid to inspect about 200 whales which had been trapped in a small hole in the sea ice in Crown Prince Gustav Channel, about 40 miles from open water. Originally there were three species, Killer Whale (*Orcinus orca*), Lesser Rorqual (*Balaenoptera acutorostrata*) and *Berardius arnuxii*, but by August all except the last species had disappeared. In the same area about 300 Crabeater Seals (*Lobodon carcinophaga*) died between September and November. The disease which killed them, and which has not yet been identified, did not affect Weddell Seals (*Leptonychotes weddelli*) in the area. They returned to Hope Bay on 27 October.

Also at Hope Bay, Massey worked on the problem of cold acclimatization, and Taylor continued his dog physiology investigations.

At Anvers Island, reconnaissance and survey of the inland area began as soon as the station was completed. Between 22 August and 20 September P. R. Hooper, J. Canty and W. J. Hindson visited the north coast of the island to do survey and geological work. In October and the first half of November, Hindson, A. J. Rennie and A. L. Shewry worked in the Copper Peak area. On 28 November, Hindson, Rennie and Shewry set out again for Mount Français and early in December reached the summit. Mount Français, 9060 ft. high, is the highest mountain on Anvers Island.

Survey from the Horseshoe Island station was hampered by unstable ice conditions in Marguerite Bay, but in September a depot was laid at the head of Bourgeois Fjord, and the first part of the route to Lallemand Fjord was reconnoitred. A large-scale local survey in the vicinity of the station was begun.

Appendix. *Wintering parties at F.I.D.S. stations, 1955*

Port Lockroy, Wiencke Island, Palmer Archipelago (*Base A*)
A. W. Carroll, Officer-in-charge and general assistant (ionospheric)
J. E. Smith, Diesel electric mechanic
B. Taylor, Wireless operator mechanic
R. J. Whittock, General assistant (ionospheric)

Deception Island, South Shetland Islands (*Base B*)
C. H. Palmer, Officer-in-charge and wireless operator mechanic
R. P. K. Clark, Meteorological observer
R. E. Cooper, Diesel electric mechanic
B. Gilpin, Meteorological assistant
W. McDowell, Meteorological assistant
P. Phipps, Meteorological observer

Hope Bay, Trinity Peninsula (*Base D*)
W. E. Anderson, Officer-in-charge and meteorological observer
D. A. Clarke, Diesel electric mechanic
R. R. Kenney, Assistant surveyor
N. A. G. Leppard, Assistant surveyor
A. F. Lewis, Meteorological assistant
P. W. Mander, Meteorological assistant
P. M. O. Massey, Medical officer
A. Precious, Meteorological observer
M. F. Tait, Meteorological assistant
R. J. F. Taylor, Dog physiologist
D. R. Willis, Wireless operator mechanic
R. F. Worswick, Meteorological assistant

Argentine Islands, west Graham Land (*Base F*)
R. V. Hesketh, Officer-in-charge and scientific officer
R. A. Berry, Meteorological assistant
H. J. Buckman, Wireless operator mechanic
F. D. Byrne, Meteorological assistant
L. Catherall, Meteorological observer
C. G. Cumming, General assistant
R. N. Ogley, Diesel electric mechanic
A. B. N. Widgery, Meteorological observer
J. H. Winstone, Senior meteorological assistant

Admiralty Bay, King George Island, South Shetland Islands (*Base G*)
J. R. Noble, Officer-in-charge and meteorological observer
G. B. Davis, Wireless operator mechanic
N. A. Hedderley, Meteorological observer
J. B. Pearce, Diesel electric mechanic
G. C. Rumsey, Meteorological assistant

Signy Island, South Orkney Islands (*Base H*)
H. Dollman, Officer-in-charge and general assistant
G. J. Bull, Diesel electric mechanic
P. A. Cordall, Meteorological observer
R. G. Napier, General assistant
L. J. Shirtcliffe, Meteorological assistant
W. L. N. Tickell, Meteorological observer
C. L. Tyson, Wireless operator mechanic

Anvers Island, Palmer Archipelago (*Base N*)
P. R. Hooper, Officer-in-charge and geologist
J. Canty, Wireless operator mechanic
W. J. Hindson, Assistant surveyor
D. B. Litchfield, General assistant, mountaineer
A. J. Rennie, Assistant surveyor
A. L. Shewry, General assistant

Horseshoe Island, Marguerite Bay, west Graham Land (Base Y)

K. M. Gaul, Officer-in-charge and general assistant
D. Atkinson, Diesel electric mechanic
J. A. Exley, Geologist
G. A. Farquhar, Wireless operator mechanic
B. Kemp, Meteorological assistant
D. J. H. Searle, Surveyor
R. D. Taylor, General assistant (meteorological)
G. T. Vine-Lott, Meteorological observer

TRANS-ANTARCTIC EXPEDITION, 1955–56

[By V. E. Fuchs. A preliminary account of the expedition was published in the *Polar Record*, Vol. 8, No. 53, 1956, p. 172.]

Leaving London on 14 November 1955, the Trans-Antarctic Expedition ship M.V. *Theron*, 849 tons, Captain Harald Marø, sailed via St Vincent, Cape Verde Islands, and Montevideo and arrived at Grytviken on 16 December. There, wings were fitted to one of the two R.A.F. "Auster" aircraft, and test flights were made with floats, so that all should be ready for use in the ice. There too the ship was re-fuelled and watered—at Leith Harbour and Husvik respectively. The fuel was sufficient for 50 days' full steaming, but the ship's freshwater capacity was inadequate, and had to be supplemented with supplies of ice.

Theron left Husvik on 21 December and we passed only an occasional iceberg until we entered a wide belt of growlers and bergy bits at 15.30 hr.[1] on the 22nd. By 18.00 hr. the ship had entered the pack ice, in lat. 63° 50′ S., long. 30° 20′ W. Our course was then 166° T. and we intended to turn more to the eastward if difficult ice conditions were met. From this time on a detailed ice-log was kept throughout the 24 hours. At first progress was rapid, but the general north-south direction of the leads forced us to take a more southerly course than we wished. By midday on 24 December the average speed had been reduced to less than 3½ knots, and ice conditions had become close and heavy. Many of the older hummocked floes were as much as 15 or 20 ft. thick, including snow cover. Frequently the bows of the ship became perched on blocks of thick blue ice which extended 12 to 15 ft. down into the water.

On 26 December we appeared to have reached the end of the leads although numerous large open pools could be seen to the south, or were indicated in the distance by sharply defined patches of water sky. After butting the ice for 4 hours the ship reached one of these pools and John Lewis took the "Auster" up to reconnoitre the situation to the south. He reported a long series of open pools extending to the south-east for about 30 miles, and said that he could see water sky far beyond that. Captain Marø immediately began working the ship along this route, and good progress was made until 11.15 hr. By then a 25-knot east wind had not only closed the leads, but was also rapidly closing the pools of open water. This meant that we could no longer make reconnaissance flights from the water, and the surface of the floes was too hummocky to use the aircraft with skis. For the next 24 days we made little voluntary movement. Sometimes by means of digging, blasting and winching, the ship was freed, and there were only a few days on which we did not move at all. Usually, our progress amounted to a few hundred yards or perhaps 2 to 3 miles. In contrast, we continually drifted 10 to 20 miles daily in a general westerly direction. At first there was a southerly component to our drift, but gradually this changed towards the north. Soon it became apparent that, under the influence of the prevailing east to south-east winds and the current flowing from the north-east, the whole vast area of sea ice which held the ship was rotating in a clockwise direction. The effect of this movement was to carry the ship farther from the area where the ice had been relatively loose and where a change of wind might again open navigable

[1] All times quoted are Local not G.M.T.

leads. In fact we observed less and less movement between floes, though, with every change of tide, there was a temporary slackening of pressure which frequently allowed us to free the ship for a short time.

On 15 January 1956 H.M.S. *Protector*, then in lat. 64° 35′ S., long. 62° 40′ W., and about 1000 miles to the west, asked if we would like a reconnaissance of the ice edge to the north of us. This was a most welcome suggestion as we did not know the shortest distance from our position, lat. 67° 43′ S., long. 30° 22′ W., to the open sea.

During the next 5 days *Theron* made slow progress to the north, and on 20 January reached a pool of open water about 350 yd. long. From this John Claydon flew off the "Auster", becoming airborne a few yards before reaching the end of the pool. In the course of a 3¼ hr. flight he discovered a possible route for the ship towards easier ice conditions 50 or 60 miles to the north. Captain Marø was able to follow the intricate course described by Claydon, and by the morning of 23 January we were moving at 4 to 6 knots through 6/8 pack ice.[1] During the night H.M.S. *Protector* had arrived at the ice edge about 70 miles north of *Theron*, and at 07.00 hr. the helicopter flew south looking for us. Owing to local snow squalls the pilot failed to find us on the first flight, but on a second sortie the helicopter arrived over *Theron* at 11.30 hr. and reported the continuation of relatively loose ice northward to the ice edge. At 20.00 hr. on 23 January, 32 days after entering the ice, we joined H.M.S. *Protector* in open water. With the exception of a few occasions the sky had remained heavily overcast with low stratus clouds and navigation had necessarily been largely by dead reckoning.

On 24 January *Theron* began steaming eastward along the ice edge, and by midday her position was lat. 65° 50′ S., long. 27° 16′ W. At 18.00 hr., when about 66 miles east of that position, the course was changed to 110° T. and the ship entered light open pack ice at reduced speed. Thereafter, with various alterations of course, we headed towards Kapp Norvegia, arriving in its vicinity at about 14.00 hr. on 26 January. It had been intended to fly over Maudheim, the old base of the Norwegian–British–Swedish Expedition, in order to estimate snow accumulation by means of the radio masts, but unfortunately visibility was so bad that flying was impossible.

Course was now set to follow the coastal ice cliffs southward. At 20.45 hr. on 27 January, after steaming through almost ice free waters, we went alongside the sea ice at Halley Bay in lat. 75° 36′ S., long 26° 45′ W. This, the Royal Society Expedition's base had been established on 6 January by Surgeon Lieut.-Commander D. G. Dalgleish on board M.V. *Tottan*. While the *Theron* had been caught in the ice the *Tottan*, taking a more easterly course, had successfully found an ice-free access to the water along the Caird Coast.

It had been planned that the Trans-Antarctic Expedition and the Royal Society Expedition should establish a joint base in the vicinity of Vahsel Bay at the head of the Weddell Sea. Unfortunately *Tottan* had been unable to penetrate farther than the southern edge of the "Dawson Lambton Glacier", where no suitable landing place could be found. Dalgleish was therefore compelled to return to a more northerly site. Less than an hour after our arrival John Lewis and I took off and flew southeast to the very heavily crevassed northern edge of the "Dawson Lambton Glacier", then inland on an easterly course. In the distance, to the east, a heavily crevassed snow rise could be seen running in a north-south direction and joining up with the "Dawson Lambton Glacier" crevassed area. Although rapidly forming low cloud prevented a full reconnaissance, enough was seen to show the improbability of a route to the south from Halley Bay. In the hope of proving the matter the *Theron* remained until 13.45 hr. on 28 January, and further flights were made but without result owing to continued bad visibility at ground level.

[1] The account in the *Polar Record*, Vol. 8, No. 53, 1955, p. 173 incorrectly states that the helicopter from H.M.S. *Protector* guided *Theron* out of the ice pack.

As we sailed southward the ice cliffs became lower and were replaced by heavily crevassed, undulating slopes reaching down to the sea. Inland the surface rose fairly rapidly to 3000 ft. or more. It seemed that the "Dawson Lambton Glacier" was not a typical glacier or ice stream, but is formed by outward movement, in all directions, of the ice which covers an isolated high land mass. South of the area, in the vicinity of lat. 76° 32′ S., is an ice cape where rapid calving of the cliffs appears to be taking place, and the whole sea was strewn with large stranded tabular icebergs and much drifting ice of all shapes and sizes. As we approached lat. 77° S. the wide expanse of coastal water became reduced to a lead only 3 miles wide between a very old and hummocked field of ice to the west, and fast ice of the same nature to the east.

We followed this single lead during the night, and it ran gradually south-west until we were 15 miles from the coast. At the same time it narrowed to a mile in width, and then to a canal 100 yd. or less across. South of lat. 77° 30′ S. the lead joined an area of open water with open pack ice closer to the coast. At lat. 77° 37′ S. it was possible to bring the ship alongside a slope where the coastal ice cliffs were only 5 or 6 ft. high. At this point it might have been possible to establish a base a few hundred feet up and some distance inland, but the route was steep and wound awkwardly between crevassed areas, the whole area appearing to be one of rapid glacier movement. At 07.00 hr. John Claydon flew with Captain Marø to look at the sea ice situation to the south. They reported that the ship was only 28 miles from Vahsel Bay, and that it should be quite easy to bring her there as a wide area of ice-free water extended to the west along the Filchner Ice Shelf.

Later John Lewis took off with David Stratton to fly directly inland from the ship to see whether the apparently smooth uncrevassed ice above 500 ft. was an ice piedmont lying below a rock or ice-covered mountain area to the east. No mountains were seen but they reported a smooth unbroken ice surface rising steadily to the east. It was decided to move on to Vahsel Bay where the aircraft rejoined the ship.

Vahsel Bay itself was filled with unbroken fast ice and an apparently floating glacier tongue, formed by the confluence of two main glaciers descending from the head of the bay. Several rocky exposures could be seen, but these were very small and had little or no elevation above the surrounding ice. They can hardly be called nunataks. At 13.45 hr. Gordon Haslop flew me west along the ice front for 45 miles. As we passed the 1500 ft. ice-covered headland that forms the west side of Vahsel Bay, a heavily crevassed area could be seen extending inland where the ice shelf abuts against the coast. Well within the edge of the fast ice, and in the angle formed between the ice shelf and the headland, was a confused area of icebergs. These were set in what appeared to be a lower, newly forming, secondary ice shelf which was here and there traversed by frozen leads. This was clearly the "ice complex" reported by Filchner in 1912.

As we flew west the even curve of the fast ice edge swept in to join the ice front at a point 25 miles west of Vahsel Bay. Evidently this fringe of fast ice had existed for a number of years because the whole ice front was drifted up to form a reasonably gentle slope (1 in 8). The continuation of this slope beyond the existing fast ice area showed that the fast ice had once continued farther west. Further on, the normal cliffs of an ice front, from 60 to 150 ft. high, were observed stretching to the west. At this time no pack ice could be seen to the west, north or north-east. Having determined that a suitable landing place was available west of Vahsel Bay we flew south-eastwards to inspect the crevassed area marking the junction of the ice shelf with the coast. The entire surface of the ice shelf exhibits an innumerable succession of waves which we later estimated on the ground to have an amplitude of 25 to 30 ft. between crests three-quarters of a mile apart. These ridges and hollows run parallel to the ice front.

We flew over a crevassed area 1 to 3 miles wide, extending for approximately

40 miles to the south from Vahsel Bay. At that point a north-facing, 100 ft. ice cliff, with a heavily crevassed and broken area at its foot, extended out of sight in a general westerly direction. Fortunately, at the junction between the ice cliff and the north-south crevassed belt, there was a smooth area apparently passable to vehicles. To the south isolated disturbances of the ice surface could be seen but these did not seem to offer any barrier to travelling. Three hours after take off we landed beside the ship which was now steaming west along the ice front, and by 19.30 hr. *Theron* was tied up alongside the fast ice half a mile from the drifted-up ice front in lat. 77° 56′ S., long. 37° 16′ W. While David Stratton and others were reconnoitering the route to the top of the ice shelf, John Claydon flew Blaiklock, the leader of the Advance Party, over the route I had followed earlier so that he should be familiar with the situation when sledging in the following spring.

During the night the R.A.F. party worked on the aircraft, replacing the floats with skis, and clearing it from the ship ready for unloading to begin in the morning.

Unloading continued steadily for 16 hours each day but was interrupted by a storm which brought great fields of pack ice down from the north, and finally broke the ship from her moorings on 1 February. Many stores on the fast ice were flooded by the waves breaking over the ice edge and, when the ship could be brought back to the site, it was necessary to take everybody aboard. Five men, however, had to be left up at "Shackleton" site because the heavy drift made it impossible for them to find their way down from the ice shelf. During the night visibility was nil owing to driving snow, but the ship was kept in open water by means of radar. This also showed a build-up of 2 miles of pack ice against the landing site. Fortunately, by 17.00 hr. the next day, the ship was able to tie up at the same position as before. There we found the five men, who had been left ashore, salvaging stores.

Soon unloading was again under way. At the same time flights were being made to keep watch on the sea ice situation, and for reconnaissance further afield. On 6 February, when flying at 6300 ft. south-east of Vahsel Bay, John Lewis and I observed a line of mountains extending in a N.E.–S.W. direction about 75 miles away. Next day, with clear conditions and the temperature −3° F., Gordon Haslop flew Kenneth Blaiklock direct to the mountains. They were found to be about 4500 ft. high and to be composed of stratified rocks that, from the air, looked the same as the Jurassic and Cretaceous sediments of Alexander Land. These mountains form a dam holding back the ice sheet to the south. In the distance could be seen another and somewhat higher range about 6,000 ft. high. As a result of these two flights it is clear that the mountains form a considerable obstacle to travelling south, but there is little doubt that a route will be found through or round the north-eastern or southern extremities of the range.

While Haslop and Blaiklock were still flying, the rapid approach of pack ice from the north, and the rafting of newly formed ice around the ship, made Captain Marø decide that it was essential to leave at the earliest possible moment. With this I was in full agreement, since there was considerable danger that the ship would be carried westward by the steady one knot current that constantly moved the ice in that direction.

The aircraft landed 4 hours after take off and was hastily brought on board before hurried goodbyes were said to the eight men staying behind. At 14.40 hr. *Theron* sailed from "Shackleton", heading east along the rapidly narrowing lead of open water. After 3 miles the pack ice closed against the fast ice before the ship could pass, and we were compelled to turn northward and force our way through the congested pack which was becoming consolidated by the freezing of the sea. Though held up periodically for the next 25 miles conditions then became easier, and by 19.15 hr. on the 8th the ship stopped alongside the fast ice at Halley Bay.

That evening we sailed for South Georgia and arrived at Grytviken on 14 February.

NOTES

THE USE OF DEHYDRATED FOODS IN FIELD CONDITIONS

[From a report by Dorothy F. Hollingsworth, Alison M. Lowden[1] and E. J. Rolfe, Scientific Adviser's Division (Food), Ministry of Agriculture, Fisheries and Food, Aberdeen.]

Between June 1953 and August 1954 thirteen expeditions were supplied with dehydrated foods from the Experimental Factory of the Ministry of Agriculture, Fisheries and Food of Aberdeen in order to test the value of these foods in field conditions. The expeditions, totalling eighty-seven people, lasted for about 432 days and went to Spitsbergen, Norway, Iceland, Lofoten Islands, north Greenland, the Himalayas, South Georgia and one of the wilder parts of Scotland. Most of the members walked and climbed for considerable distances, and carried or hauled heavy loads. The weather was not unduly severe, but cold winds, rain and snow were met with in some areas. Parties lived in tents or simple huts.

Before leaving Great Britain members were instructed in the use of the foods by the staff of the Scientific Adviser's Division (Food) of the Ministry of Agriculture, Fisheries and Food, and given general advice on diet. Most of the parties took a wide range of dehydrated foods and, in all cases, these formed an important part of their diet during the expedition, usually forming the basis of the day's main meal.

Dehydrated foods supplied to expeditions

Meat bars. Twelve expeditions were given meat bars. These 5 oz. blocks are made of equal quantities of vacuum-dried minced cooked beef and pork, containing 40 per cent fat and 7½ per cent moisture, and are equivalent to 15 oz. of raw boneless meat. They may be eaten dry or reconstituted in water and made into stew. All members ate at least two of these bars, and some had as many as thirty each, during periods of 5 to 8 weeks. Some people found them too fatty but most liked them to some degree. About a quarter of a bar was usually sufficient to eat dry, and half to three-quarters as a portion of stew. The stew required seasoning and "thickening" to make it palatable.

Meat and vegetable blocks. These are a combination of 40 per cent vacuum dehydrated minced cooked beef with vegetables, herbs and seasonings and are intended to be used as a stew or soup. They were generally liked, though thought by some to be too highly seasoned, and were most popular when mixed with meat bars.

Minced meat. Vacuum-dried minced cooked beef and pork; this was generally popular.

Stewing meat and kidney. Vacuum-dried and prepared in cubes. Although these meats were liked they were less popular than the minced meats because they took more time and trouble to prepare.

[1] Now of the War Office Army Medical Directorate.

Fish. Vacuum-dried cod in the form of fillets, dehydrated as a continuous layer and sawn into pieces convenient for packing, or in the form of dehydrated cod trimmings. This food was generally liked.

Cabbage. Dehydrated cabbage was popular with the eight expeditions who took it.

Carrots in strips or slices. Less popular than cabbage owing to the time required for reconstitution, but the taste was not criticized.

Potatoes. These are in the form of vacuum-dried strips or dice and were generally popular.

Tomatoes. Vacuum-dried. These were popular with most parties.

Fruit. Vacuum-dried apples, black currants, plums, bananas, peaches, raspberries and pineapple. These were very popular with most parties.

Method and average time of reconstitution

Detailed instructions and recipes are supplied with the various foodstuffs, but a rough guide to the time required to reconstitute the foods is as follows:

Meat bars. Simmer for 30 to 45 minutes.

Meat and vegetable blocks. Simmer for 30 to 35 minutes.

Stewing meat and kidney. Soak in cold water for 1 to 2 hours.

Fish. Soak in cold water for 1½ to 2 hours, until the flesh becomes soft.

Cabbage. Boil gently for 8 to 15 minutes.

Carrots and Potatoes. Varies from immediate cooking to soaking from 1 to 2 hours according to the form in which they are supplied.

Tomatoes. Soak for 2 hours.

Fruit. Soak for 2 hours, or, in the case of pineapple, for 12 hours.

Packing

The meat bars and the meat and vegetables blocks were packed in pouches made of laminated cellophane, aluminium foil and pliofilm which has been evacuated and sealed. This form of packing was entirely successful even when left in damp conditions for long periods.

The stewing meats, fish, vegetables and fruit were packed in nitrogen in large round cans. It was suggested that rectangular tins would be more convenient to pack and carry; this advantage is offset by their greater liability to develop leaks at the seams. It was also hoped that some form of pliofilm pack could replace tin-plate as a packing material for dehydrated foods. This material, however, is very liable to puncture and, unless it contains expensive aluminium foil, is permeable to oxygen.

Conclusions

No party lived entirely on dehydrated foods, and the amount used by each party differed considerably, so definite conclusions cannot be drawn as to their dietary value. All the expeditions, however, reported excellent health, and members undoubtedly appreciated the addition made to the appearance, variety and palatability of their diet by these foods.

THE GREENLAND BIRD-RINGING SCHEME

[Summarized from information provided by Dr Finn Salomonsen, Universitetets Zoologiske Museum, København.]

In 1946 Grønlands Styrelse (now Ministeriet for Grønland), in collaboration with Universitetets Zoologiske Museum, København, began to organize systematic bird-ringing in Greenland. The project is under the general supervision of Dr Finn Salomonsen.

Administrative officials throughout Greenland organize bird-ringing as part of their official duties. Supplies of rings and notebooks are sent to about eighty centres each year, and are given to suitable men chosen by the local officials. A reward is paid for each bird ringed. This varies according to the difficulties from Kr. 10 for ringing a Sea Eagle to 12 øre for a Snow Bunting. The large reward paid for Sea Eagles is also to encourage people to ring the nestlings rather than eat them. In the south-west of Greenland, where the inhabitants earn a steady income during the summer from fishing, it is often difficult to attract bird ringers. In the more primitive areas of Thule, Upernavik and Umanak, however, the rewards form a welcome addition to a family income and large numbers are ringed.

The rings are made of aluminium and have the address of the museum stamped on them. They are made in eight sizes, each size having a serial number, and are issued in envelopes containing ten to twenty rings of one size. The notebooks contain detailed instructions.

In the autumn the notebooks and unused rings are returned to Universitetets Zoologiske Museum.

A reward of Kr. 2 is also offered for the recovery of a ringed bird. In order to claim the reward the foot of the bird bearing the ring must be presented to the local magistrate. This enables the species to be identified. No reward is paid if the bird is recaptured in the breeding place in which it was ringed.

The expenses of the project are borne by Ministeriet for Grønland and amount annually to about Kr. 10,000.

During the years 1946–54, inclusive, 30,215 birds have been ringed, and 2474 have been recovered. Nearly all the recoveries are due to shooting and netting. The percentage of ringed birds recovered, 8·2 per cent, can therefore be taken as an approximate measurement of destruction by man. The table gives figures for ringing and recoveries of some common species. Most of the recoveries have been in Greenland; this is due to the large number of marine species which remain in Greenland waters and are shot during autumn and winter in south Greenland. Recoveries of Little Auks are all due to netting by Eskimo at breeding places; there have been no recoveries during the winter in the south-west of Greenland. The difference in recoveries between Common Eider and King Eider is due to the time at which each is ringed. King Eiders are ringed only when adult and flightless. Common Eiders are ringed when nestlings, and are likely to be shot when young and inexperienced and therefore easier to shoot than older birds. The small number of recoveries among Kittiwakes and Brünnich's Guillemots is due to the fact that both species

spend the winter months in off-shore waters. It is interesting that 16·3 per cent of White-fronted Geese are shot in their wintering ground in Britain, and only 7 per cent in Greenland.

One of the reasons for bird-ringing is to discover whether any species is being destroyed in sufficiently large numbers to call for protection. In Greenland only the Sea Eagle and Cormorant are considered to be in this position.

Ringing and recoveries of some common species of Greenland birds

Species	Number ringed	Number of recoveries: In Greenland	Number of recoveries: Abroad
Brünnich's Guillemot (*Uria lomvia*)	4381	158	23
Kittiwake (*Rissa tridactyla*)	3734	139	4
Arctic Tern (*Sterna paradisea*)	3237	55	3
Snow Bunting (*Plectrophenax nivalis*)	2788	66	8
Little Auk (*Plotus alle*)	2470	437	1
King Eider (*Somateria spectabilis*)	1968	72	2
Black Guillemot (*Cepphus grylle*)	1931	331	—
Iceland Gull (*Larus glaucoides*)	1670	367	5
Wheatear (*Oenanthe oenanthe*)	1267	10	3
Common Eider (*Somateria mollissima*)	1010	144	—
Fulmar Petrel (*Fulmarus glacialis*)	976	54	2
White-fronted Goose (*Anser albifrons*)	781	55	127
Glaucous Gull (*Larus hyperboreus*)	774	91	—
Cormorant (*Phalacrocorax carbo*)	351	107	—
Mallard (*Anas platyrhyncha*)	350	37	—
Great Black-backed Gull (*Larus marinus*)	233	36	—
Ptarmigan (*Lagopus mutus*)	158	25	—
Purple Sandpiper (*Calidris maritima*)	131	27	—
Raven (*Corvus corax*)	98	27	—
Sea Eagle (*Haliætus albicilla*)	39	15	—
Long-tailed Duck (*Clangula hyemalis*)	33	1	2

Ringing also provides valuable information about the migratory routes and destinations of Greenland birds. Snow Buntings and Wheatears share the same breeding grounds but in winter migrate to Canada and Europe respectively. Long-tailed Duck, ringed on Disko, have been recovered in places as far apart as the Baltic Sea and the Alaskan border of Canada. King Eiders ringed during their moult-migration in late summer have been recovered in northern Canada. The migratory route of the White-fronted Goose is shown to skirt south-west Iceland to wintering grounds in Eire and Scotland. An Arctic Tern was recovered in Natal, South Africa, after having flown 18,000 km. in under 3 months.

Detailed accounts of the Greenland ringing scheme[1] and full lists of recoveries outside Greenland,[2] are published by Ministeriet for Grønland.

References

[1] Finn Salomonsen. *Beretninger vedrørende Grønlands Styrelse*, No. 1, 1948, p. 56–62 (for 1946 and 1947); No. 2, 1949, p. 59–61 (for 1948); No. 1, 1950, p. 81–85 (for 1949). *Beretninger vedrørende Grønland* 1955, in press (for 1950–54).

[2] Finn Salmonsen. *Dansk Ornithologisk Forenings Tidsskrift*, Årg. 41, 1947, p. 141–43; Årg. 42, 1948, p. 100–02; Årg. 43, 1949, p. 251–55; Årg. 44, 1950, p. 168–70; Årg. 46, 1952, p. 110–17; Årg. 49, 1955, p. 130–35.

EXPERIMENTAL REINDEER HUSBANDRY IN WEST GREENLAND

[Summarized from articles by Jens Fynbo in *Grønland*, 1954, Januar, p. 26–28; 1954, Nr. 3, p. 95–100; 1954, Nr. 5, p. 193–97; by Jens Rosing in *Atuagagdliutit/Grønlandsposten*, 1952, Nr. 22, p. 372–74, and *Grønland*, 1955, Nr. 6, p. 225–31; from *Beretninger vedrørende Grønland*, 1954, Nr. 1, p. 101; and from notes in *Atuagagdliutit/Grønlandsposten*, 1953, Nr. 21, p. 393 and 1954, Nr. 24–25, p. 19.]

Large herds of wild reindeer existed in west Greenland in the last century, and around 1840 nearly 30,000 were being shot annually. The resulting decrease of the stock has meant that reindeer meat has ceased to play its former important part in the diet of Greenlanders. It is believed that west Greenland pasture is sufficient to support large herds, but Knud Rasmussen's investigations at the beginning of this century into the possibilities of introducing domestic reindeer into Greenland led to nothing at the time, although the question has since been discussed more than once by the Greenland landsråd.

In 1949, however, an initiative taken by the Greenlander Jens Rosing received the support of Grønlandsdepartementet. Early in 1950 he went to Swedish Lapland to study reindeer husbandry, and for the second half of that year worked as a reindeer herder. During the following winter he studied reindeer husbandry problems in north and central Norway. Grønlandsdepartementet made contact with Norwegian experts (in particular Byråsjef Arne Hallsjø and Veterinærdirektør Slagsvoll) in order to make the investigations necessary for an experiment which it is hoped will establish a new source of food and income for the west Greenlanders. Advice was also given by the Danish veterinary experts Wøldike Nielsen and Sjelle Hansen.

In 1951 Jens Rosing and the Lapp Anders Stueng went to Greenland and decided that the most suitable place for establishing the reindeer would be Korkutlandet, a large peninsula in the Godthåb region. This choice was confirmed by the Norwegian Lappfoged Peder Hagen.

It was decided that reindeer from Finnmarken were the hardiest and best suited for Greenland conditions. Lappfoged Pleym in Vadsø arranged the purchase of the animals from reindeer owners. A new cargo ship, the *Hanne S*, was chosen to transport a herd of about 300 reindeer from Kjøllefjord to Greenland. Originally planned for the beginning of August 1952, the embarkation was postponed until 1 September in order to allow the reindeer to complete their antler "cleaning". Danish and Norwegian veterinary experts, and representatives of both the Norwegian Landbruksdepartement (Ministry of Agriculture) and the Danish Statsministerium (Prime Minister's Office) travelled to Kjøllefjord to supervise their loading. The *Hanne S* was late in arriving and the reindeer owners raised the price of their animals in order to compensate themselves for the risk to their remaining reindeer caused by postponing the seasonal migration to winter pastures. The ship arrived on 10 September, and, in two days, 300 reindeer were collected in a fold outside the town, transported to the quayside in crates by lorry, and, still in their crates, loaded into the hold of the ship. Here they were put into stalls; four reindeer to each stall. The *Hanne S* put out from Kjøllefjord on the afternoon

of 12 September, accompanied by Jens Rosing with two assistants and four reindeer dogs.

The passage to Greenland was rough and many reindeer became weak and feverish; 37 died during the crossing. It has since been established that the reindeer were suffering from urine poisoning in their drinking water.

On 25 September the reindeer were put ashore on Angmagssiviupnua, a promontory on the north side of Korkut-landet.

The herd proved far less docile than expected, and great difficulty was experienced for a long time in getting it to move on to the big pasture grounds in the south-west of the peninsula. During the winter of 1952-53 the reindeer maintained themselves in the hills at between 300 and 500 m. above sea-level, where they found excellent pasture. During the first half of 1953 the herd was so unmanageable that a fence had to be erected across the 4½ km. wide isthmus at Itvinera, which connects Korkut-landet with the mainland.

Jens Rosing has been in charge of the experiment in Greenland from the beginning, and has been assisted by the Norwegian Lapps Jon Balto and Jon Eira. It is hoped that Greenlanders can be trained to continue the work of tending the reindeer in the future.

The introduced herd has done well. In September 1952, 263 reindeer were landed. A number failed to survive the winter of 1952–53, including some animals killed by an avalanche. Between 12 May and 15 June 1953, 63 calves were born. This increase was achieved despite the disturbance suffered by the animals during the rutting season, which partly coincided with the move from Norway. Seven calves were also lost in the course of calving. The herd numbered 311 at the end of 1953. The yearling calves had grown so fast that it was hard to distinguish them from the cows; similar development is only known in one part of Norway, where conditions are exceptionally good.

The Norwegian veterinary expert Magnus Lie visited the herd in May 1953 to study the risk of gad-fly being introduced into Greenland. He considered it unlikely that this pest would be able to develop there.

The herd increased still further in 1954, and 13 animals were killed when the first slaughtering took place at the end of the year.

The composition of the herd on 15 May 1955 was as follows:

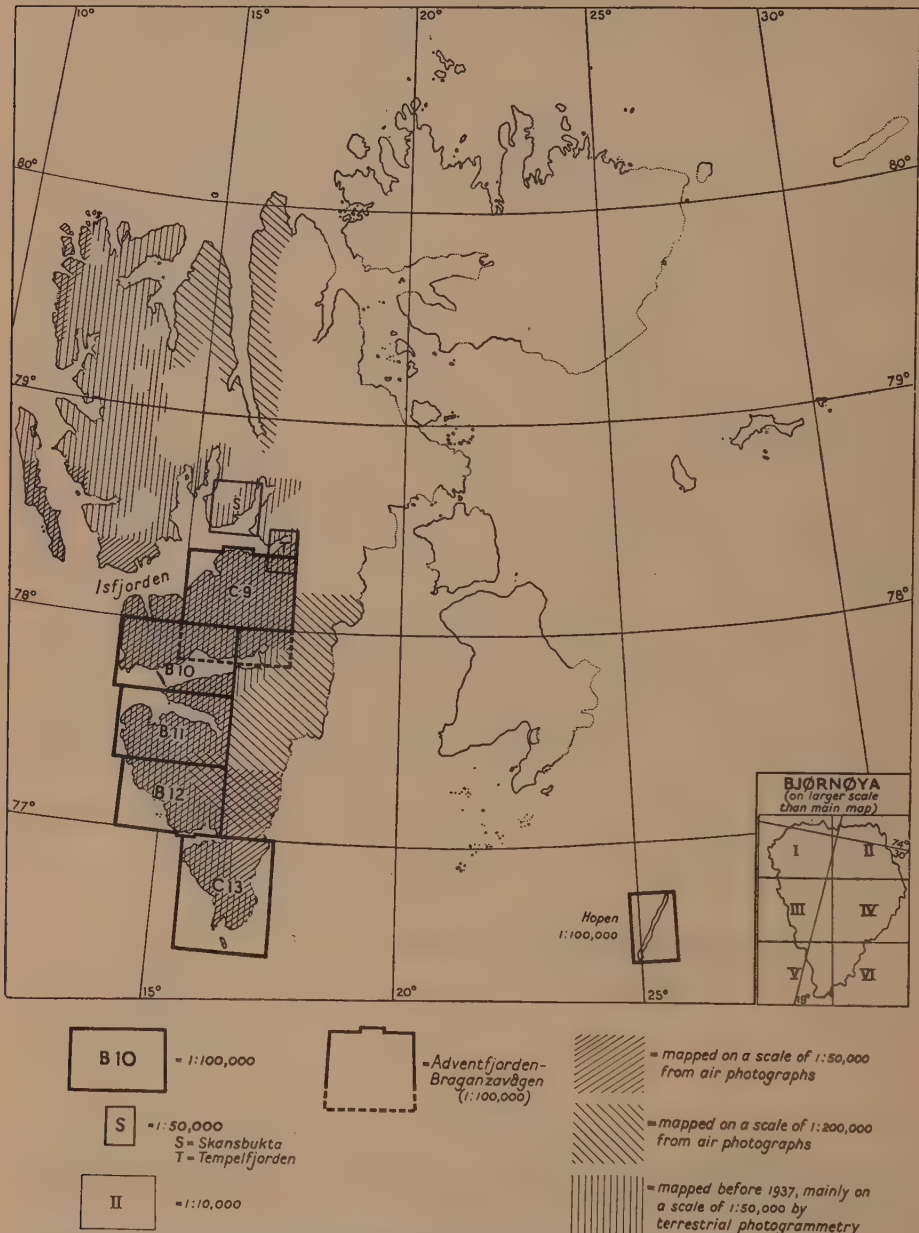
	Bulls	Cows
4 to 5-year-old animals from Finnmarken	17	207
2-year-old animals, born 1953	25	33
1-year-old animals, born 1954	99	78
	141	318
	459	

NORWEGIAN TOPOGRAPHICAL MAPS OF SVALBARD

[Based on information in *Norsk Polarinstitutt*. Skrifter, Nr. 1. 73, 86, 88, and 90; *Norsk Polarinstitutt. Meddelelser*, Nr. 68; *Polarboken*, 1955, p. 181–86; and on information supplied by B. Luncke.]

The official topographical maps of Svalbard are published by Norsk Polarinstitutt, Oslo, and are obtainable through Norges Geografiske Oppmåling, Oslo.

Norwegian survey of Svalbard began with Prince Albert of Monaco's expeditions in 1906 and 1907, led by Gunnar Isachsen. Between then and 1937, 18,643 sq.km. were mapped, all in Vestspitsbergen, and mainly on a scale of



Sheet lines of Norwegian topographical maps of Svalbard on scales of 1:100,000, 1:50,000 and 1:10,000, and plotting scales of areas mapped.

1 : 50,000, by terrestial photogrammetric methods. In 1936 an air survey of Svalbard was started. In that year B. Luncke took 3300 oblique air photographs covering about 40,000 sq.km. in Vestspitsbergen, Prins Karls Forland, Barentsøya and Edgeøya. In 1938 he took 2200 oblique photographs covering 25,000 sq.km. in northern Vestspitsbergen and western Nordaustlandet; the short range of the aircraft prevented coverage of the eastern side of Nordaustlandet. In 1948 Luncke covered Hopen by vertical photographs. Some ground and air photography remains to complete the survey. The air photographs have been used to construct maps on scales of 1 : 200,000 and 1 : 50,000; the smaller scale being intended as the basis for future general maps on scales of 1 : 1,000,000 and 1 : 500,000. Areas which have been mapped are shown on the key map.

The following maps of Svalbard have been published:

1 : 2,000,000. A map of the whole of Svalbard on this scale was issued in 1937. A revised edition distinguishing glaciers and ice-free land was produced in 1943.

1 : 500,000. In 1925 Det Kongelige Departement for Handel, Sjøfart, Industri og Fiske, Oslo, issued a map in four sheets on this scale covering Spitsbergen, Kong Karls Land, Hopen and Kvitøya. On it, water is shown in blue, and relief, where known, by orange form lines and spot heights.

1 : 100,000. A provisional map of the Adventfjorden-Braganzavågen area was issued in 1941. It is printed in grey with black lettering. It coincides with sheet C 9 of the Topografisk Kart over Svalbard (see below) except that it extends further south, as shown by the pecked line on the key map.

A provisional map of Hopen was published in 1949. It is in black and white with contours at 50 m. intervals.

1 : 50,000. Maps of Skansbukta and Tempelfjorden (on tracing cloth) were produced in 1940 and 1941 respectively. Contour lines are shown at 50 m. intervals and spot heights are marked.

1 : 25,000. In 1925 a map of Bjørnøya, covering the whole island in one sheet, was issued by Det Kongelige Departement for Handel, Sjøfart, Industri og Fiske, Oslo. A new edition followed in 1944. On it water is shown in blue, and brown contours are shown at 10 m. intervals.

1 : 10,000. The map of Bjørnøya on this scale consists of six sheets, as shown on the key map. It was also published in 1925. Brown contour lines are shown at 10 m. intervals but there is no blue tinting for water. Sheet names are as follows:

I	Flåtvatna	II	Tunheim
III	Røyevatnet	IV	Miseryfjellet
V	Ellasjøen	VI	Sørhamna

Topografisk Kart over Svalbard. This is the main map series issued by Norsk Polarinstitutt and is on a scale of 1 : 100,000. It is intended eventually to cover the whole of Svalbard in about 50 sheets.

The maps already published are based on ground work carried out between 1911 and 1925 and on oblique air photographs taken from a height of 3000–3500 m. in 1936 and 1938. They are plotted on a scale of 1 : 50,000 with

a Zeiss stereoplanigraph and two of these sheets together make one of the published 1 : 100,000 sheets. Five sheets have been published; these are, with dates of publication:

B 10	Van Mijenfjorden, 1948	C 9	Adventdalen, 1950
B 11	Van Keulenfjorden, 1952	C 13	Sørkapp, 1948
B 12	Torellbreen, 1953		

A sixth sheet, B 9 Isfjorden, has gone to press.

Water is shown in pale green or blue. Relief is shown by a combination of contours at 50 m. intervals (brown on land and blue on glacier surfaces), hill shading (brown on land and pale green on glaciers) and spot heights. Glacier fronts extending into the sea, and therefore subject to change, are marked with a date.

The price of each sheet is N.Kr. 35.

SEARCH AND RESCUE DEVICE, "SARAH"

[Summarized from information provided by Messrs Ultra Electric Limited, London.]

A search and homing device known as "SARAH" (Search and Rescue and Homing) has proved extremely successful in the location of personnel wrecked on land or sea. It has been in use by the Royal Air Force for some time and is being extensively adopted by air forces throughout the Commonwealth, and elsewhere.

The device operates by the use of powerful radio signals. It consists of two parts, a beacon equipment carried by the aircrew, and rescue receiving equipment carried by the rescuing aircraft or ship.

The beacon equipment consists of a radio beacon transmitter with aerial (weight 7½ oz.), a speech unit, which is optional (weight 12 oz.), battery (weight 29 oz.), and coding unit and interconnexion cables (weight 8 oz.). There are only three valves, one for the beacon and two for voice transmission. The equipment is attached to a life jacket and is put into operation on the release of a self-erecting flexible metal tape aerial. It then transmits a coded pulse generated in a radio-frequency oscillator, with a repeating sequence controlled to provide groups of pulses at a suitable low-pulse repetition frequency. The characteristic pulse spacing in each pulse group permits identification of different beacons in the same area. The peak power output of the beacon is about 15 W. at 243 m/c., which gives an operational range of about 70 nautical miles to a rescue aircraft at 10,000 ft. and 6 nautical miles to a ship equipped with a receiver aerial 25 to 30 ft. high. The capacity of the battery is sufficient to maintain a continuous signal for 20 hours. Fixes from an altitude of 500 ft. are accurate to within 100 ft. The peak power when transmitting speech is less than a quarter of that of beacon pulse transmission, so the range of communication is correspondingly reduced. The battery capacity will allow 1 hour of speech transmission in addition to 19 hours beacon operation. Two-way voice communication may be achieved by switching on to "talk" or "listen", but homing signals continue to be transmitted. The selector switch, which determines the type of operation, requires a definite effort to hold in any position

except "Beacon" thus ensuring that when switched on the transmitter operates on "Beacon".

The equipment has been proved to operate in the following conditions: prolonged total immersion in sea water, temperature range from $-50°$ to $70°$ C., altitude up to 60,000 ft., vibration over the whole aircraft range, and shock in excess of 50 G.

The rescue receiving equipment consists of receiver and power unit, together weighing $15\frac{1}{2}$ lb. The receiver provides a visual indication, on a cathode-ray tube, of beacon signals received from directional aerials. It contains a low-power, tunable c.w. transmitter and receiver which permit two-way communication with "SARAH" speech beacons. Two search aerials, one looking to port and one to starboard, with an area of overlap ahead, are used. The receiver connects automatically with each aerial alternately. The first of each pair of pulses transmitted by a beacon forms a vertical line on the cathode-ray tube. The second pulse deflects the line horizontally. A deflexion to the left of the vertical line results from signals received through the starboard. Direction is thus obtained and homing is achieved by steering the search craft so as to keep left and right deflexions equal.

The transmitter can be switched to transmit beacon type impulses, thus enabling rescue craft to keep in contact with each other.

McGILL UNIVERSITY SUB-ARCTIC RESEARCH LABORATORY, KNOB LAKE, QUEBEC

[Summarized from information provided by Professor F. K. Hare.]

During the summer of 1954 McGill University built a research laboratory at Knob Lake, Quebec, the new mining town of the Iron Ore Company of Canada. The object was to set up a field station in sub-arctic territory yet with the facilities of a nearby railway. Professor F. K. Hare is in general administrative charge of the project. Professor R. Norman Drummond is the Field Director, and the assistants for the season 1955–56 are J. J. Boisvert, J. D. Fox, E. M. Fraser and G. R. Twidale.

Living accommodation, laboratories and stores are, at present, housed in a single two-story prefabricated building. A second building, now under construction, will house the main laboratory.

The laboratory is equipped for field studies in biology, geology and geography. In addition to the university staff, a few visiting scientists can be accommodated.

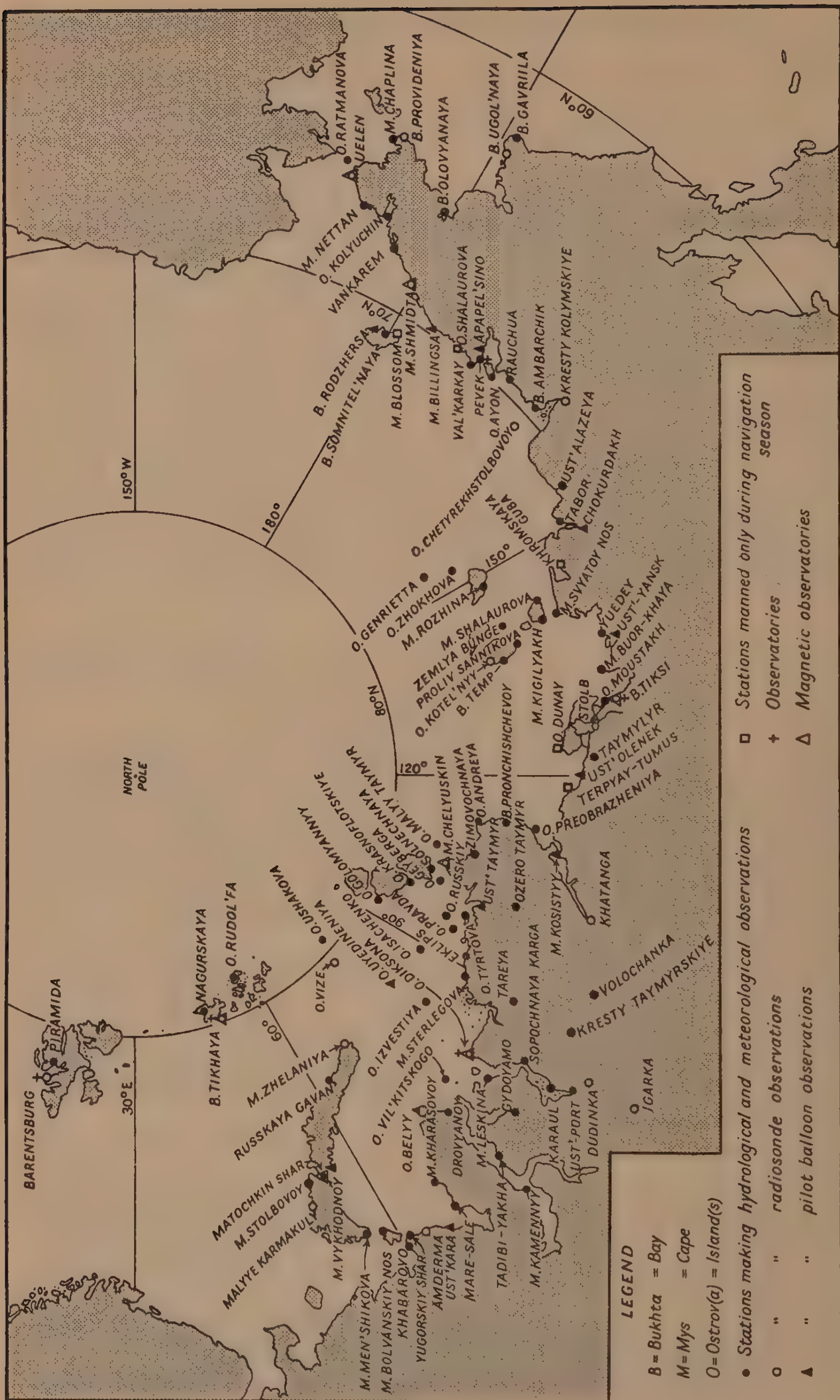
The scientific programme in 1955 included:

(1) Meteorological observations under contract with the Department of Transport.

(2) Ionospheric and radio-propagation research in the auroral zone. The work was directed by Dr Millett Morgan of the Thayer Engineering School, Dartmouth College. The college has installed a radio transmitting station for this purpose.

(3) A snow-survey carried out for the National Research Council, and snow-patch studies being made by J. L. Ives of McGill University.

(4) Summer field studies in geomorphology, ecology and microclimatology.



Soviet polar stations under the jurisdiction of the Chief Administration of the Northern Sea Route, June 1956.

SOVIET POLAR STATIONS, 1956

The map opposite shows the name, location and function of 107 polar stations under the jurisdiction of the Chief Administration of the Northern Sea Route [Glavsevmorput] in June 1956. It is based on information supplied by the Arctic Institute [Arkticheskiy Nauchno-Issledovatel'skiy Institut] in Leningrad.

There are certain discrepancies between the information on which this map is based and that given on a map produced in 1956 by the Chief Administration of the Northern Sea Route [Glavsevmorput'] to illustrate proposed Soviet arctic I.G.Y. stations. The latter map shows 111 stations. It omits the stations at Bukhta Somnitel'naya and Matochkin Shar, but includes six others. The names of these six are not known, but their locations are roughly as follows (from west to east): one on Ostrov Sibiryakova (opposite Mys Leskina), two near the mouth of the Pyasina, one on the mainland west of Zimovochnaya, one between Khatanga and Mys Kosistyy, and one between Mys Shmidta and Vankarem. The reason for the discrepancies is not known.

OBITUARY

Surgeon Commander George Murray Levick (R.N. retired) was born in 1877 and died on 29 May 1956. He qualified at St Bartholomew's Hospital in 1902 and later joined the Royal Navy. In 1910 he was given leave of absence to accompany the British Antarctic ("Terra Nova") Expedition, 1910–13. He was medical officer to the Northern Party during the expedition. In 1913 he returned to the Navy.

He was always interested in physical training for boys and, in 1932, founded the British Schools Exploring Society and took an active part in its activities for the rest of his life.

Levick's popularity with his colleagues on the "Terra Nova" Expedition can be gathered from his nicknames, which included "The Old Sport" and "Tofferino". His comparative slowness in taking in a situation, and his imperturbable good temper, ensured that he came in for more teasing than most, while his strength—he had been a notable rugger man—made him an excellent man in the sledge-traces.

He would not have called himself a scientist but he was a careful and patient observer of the Adélie Penguins which his party lived amongst at Cape Adare, and his book was, for a long time, the standard one on that interesting group of birds. After a comparatively small number of lessons from H. G. Ponting, he made himself a competent photographer, for which his patience rewarded him with pictures which a hasty man would have missed.

As medical officer to the Northern Party he had a great deal more sickness to deal with than falls to the lot of most Antarctic doctors. The conditions under which his party, under Lieut. Campbell, lived in their ice cave for the winter of 1912, were such as to induce dysenteric symptoms, a type of illness not met with under normal sledging routine. That he brought the party through without fatality was greatly to his credit, as too was his co-operation with Raymond Priestley in keeping the party cheerful throughout their discomfort.

F. D.

J. J. Miller died on 10 October 1955. He was a member of the "Discovery" Expedition, 1929–31. At his special request Miller's ashes were taken to the Antarctic in the *Theron* and were lowered through the pack ice of the Weddell Sea.

RECENT POLAR LITERATURE

This selected bibliography has been prepared by R. J. Adie, Terence Armstrong, T. H. Ellison, Amorey Gethin, J. W. Glen, W. B. Harland, H. G. R. King, Brian Roberts and Ann Savours. Its main field is the polar regions, but it also includes other related subjects such as "applied" glaciology (e.g. snow ploughs and ice engineering). For the literature on the scientific study of snow and ice and of their effects on the earth, readers should consult the bibliographies in each issue of the *Journal of Glaciology*. For Russian material, the system of transliteration used is that agreed by the U.S. Board on Geographic Names and the Permanent Committee on Geographical Names for British Official Use in 1947 (see *Polar Record*, Vol. 6, No. 44, 1952, p. 546).

Reprints of "Recent Polar Literature", from Nos. 37/38 onwards, can be obtained separately (to allow references to be cut out for pasting on index cards) from the Institute, price 2*s*. 6*d*. for two reprints. Copies will be sent without charge to organizations with which the Institute maintains exchange arrangements and which notify their wish to receive them. Readers can greatly assist by sending copies of their publications to the library of the Institute.

ARCTIC

ALLEN, CLIFFORD M. Geology of the Cotton Lake area, Cross mining division, Manitoba. *Province of Manitoba. Department of Mines and Natural Resources. Mines Branch. Publication*, 53–2, 1954, [iv], 24 p. map (in separate folder). [Based on field work, summer 1953.]

ANTHON, HENNING, *and* BOËTIUS, JAN. *Nordiske fugle*. København, Gyldendal, 1950–54. 4 vols. illus. 25 cm. 225 D.Kr. [Scandinavian birds, resident and migratory. 240 coloured plates, by H. Anthon, covering every species; Latin, Danish, Norwegian, Swedish names given.]

BABERO, BERT B. Studies on the helminth fauna of Alaska. XII. The experimental infection of Alaskan gulls (*Larus glaucescens* Naumann) with *Diphyllobothrium* sp. *Journal of the Washington Academy of Sciences*, Vol. 43, No. 5, 1953, p. 166–68. [50 per cent of specimens infected. Specific identity of cestode undetermined.]

BABERO, BERT B. Studies on the helminth fauna of Alaska. XVI. A survey of the helminth parasites of ptarmigan (*Lagopus* spp.). *Journal of Parasitology*, Vol. 39, No. 5, 1953, p. 538–45, illus.

BAGARYATSKIY, B. A. V geofizicheskom institute (issledovaniye polyarnykh siyaniy). [In the Geophysical Institute (study of aurora)]. *Vestnik Akademii Nauk SSSR* [*Messenger of the Academy of Sciences of the U.S.S.R.*], 1955, No. 1, p. 110. [Scope of recent work at Institute's observatory at Murmansk.]

BAILLIE, ANDREW D. Devonian system of the Williston Basin area. *Province of Manitoba, Mines Branch. Publication*, 52–5, 1953, [x], 105 p. maps. (nine folding in separate vol.) [Stratigraphic analysis.]

BAKER, R. North Lyngen, 1954. *Cambridge Mountaineering*, 1955, p. 42–46, map. [Narrative of mountaineering expedition, north Norway led by J. C. H. Davis.]

BALCHEN, BERNT. Litt om "flytende isøyer" og deres historie. *Polarboken*, 1955, p. 73–85, illus. [History of observations and occupation of ice islands in Arctic; organization of 10th Rescue Squadron, Alaskan Air Command.]

BARTHOLOMEW, GEORGE A., *jr*., *and* HOEL, PAUL G. Reproductive behaviour of the Alaska Fur Seal, *Callorhinus ursinus*. *Journal of Mammalogy*, Vol. 34, No. 4, 1953, p. 417–36, illus. [Time relationships established for group of harems on St Paul Island, June–August, 1951].

BECKEL, W. E. Studies of the biology of the *Aedes* of northern Canada (Culicidae). 6. Collection of northern *Aedes* mosquito eggs from field-collected females. *Canada. Defence Research Northern Laboratory*, DRNL Technical Paper No. 11, 1954, 5 p. illus. [Three methods of collection described.]

BECKEL, W. E., *and* COPPS, T. P. *Laboratory rearing of the adults of northern Aedes mosquitoes* (*Culicidae*). Ottawa, Defence Research Board, 1955. 10 leaves, illus. 28 cm. (DRNL Report No. 7/55.) [Attempts to rear *Aedes communis* and other species found in northern Canada.]

BELOV, M. I. Novyye materialy o pokhodakh ustyuzhskogo kuptsa Nikity Shalaurova [New material concerning the voyages of the Ustyug merchant Nikita Shalaurov]. *Geograficheskiy Sbornik* [*Collected Geographical Papers*], No. 3, 1954, p. 160–84, maps. [Archive sources on his voyages in Laptev and East Siberian Seas, 1755–64.]

BEMMELEN, R. W. VAN, *and* RUTTEN, M. G. *Tablemountains of northern Iceland (and related geological notes)*. Leiden, E. J. Brill. 1955, viii, 217 p. illus., maps (4 folding at end), 52 plates (following p. 217), 28 cm. [Report on geological field work, especially in Myvatn district and Ódádahraun, summer 1950.]

BERLIOZ, J., *and* JOUANIN, CHRISTIAN. Étude d'une collection d'oiseaux des Iles Pribilof. *Bulletin du Muséum d'Histoire Naturelle* (Paris), 2e série, Tome 23, No. 6, 1951, p. 610–15. [Description of collection of birds made on St Paul Island, July–August 1951.]

BETESHEVA, YE. I. Pitaniye usatykh kitov v rayone vod Kuril'skoy gryady [Feeding of baleen whales in the waters of the Kuril ridge]. *Trudy Instituta Okeanologii* [*Transactions of the Institute of Oceanography*], Tom 18, 1955, p. 78–85. [Analysis of stomach contents collected in 1953. Continuation of author's paper in Tom 11, 1954, of same journal.]

BIRD, J. BRIAN. Terrain conditions in the central Canadian Arctic. *Geographical Bulletin* (Ottawa, Department of Mines and Technical Surveys, Geographical Branch), No. 7, 1955, p. 1–16, illus., maps. [Study of area west of Hudson Bay. Effects of permafrost and glaciation.]

BISTRUP, AAGE. Slædehunden. *Grønland*, 1955, Nr. 8, p. 305–10, illus. [The Greenland sledge-dog; training; descent; occasional appearance of mongrel traits.]

BJARNASON, INGI. Noen veiinger av hval. *Norsk Hvalfangst-Tidende*, Årg. 43, Nr. 1, 1954, p. 8–11, illus. [Weight of various anatomical parts of 2 Fin Whales, 1 Sei Whale and 1 Sperm Whale, taken at Hvalfjorður, Iceland. In Norwegian and English.]

BLACK, SAMUEL. *A journal of a voyage from Rocky Mountain portage in Peace River to the sources of Finlays Branch and North West Ward in summer 1824. Edited by E. E. Rich, assisted by A. M. Johnson, with an introduction by R. M. Patterson.* London, Hudson's Bay Record Society, 1955. c, [266] p. illus., map (folding at end). 24½ cm. (*Publications of the Hudson's Bay Record Society*, 18). [British Columbia. Includes biographical introduction.]

BOLDARUYEV, V. O. Parazity sibirskogo shelkopryada (*Dendrolimus sibiricus* Tshtv.) v vostochnoy Sibiri [Parasites of the Siberian silkworm (*Dendrolimus sibiricus* Tshtv.) in Eastern Siberia]. *Entomologicheskoye Obozreniye* [*Entomological Review*], Tom 32, 1952, p. 56–68, illus. [Observed in Irkutsk region, 1940–50.]

BOUT, PIERRE, *and others*. Géomorphologie et glaciologie en Islande centrale, par P. Bout, J. Corbel, M. Derruau, L. Garavel et Ch. P. Péguy (1). *Norois*, 2e Année, No. 8, 1955, p. 461–571, illus., maps. [Includes studies of glacier regime of Hofsjökull, also temperature, "rock glaciers" and geomorphology of central Iceland. English summary.]

BREMNER, PETER C. Diamond drilling in permafrost at Resolute Bay, Northwest Territories. *Publications of the Dominion Observatory, Ottawa*, Vol. 16, No. 12, 1955, p. 367–90, illus. [Experiments to determine temperature gradient, 1950–53. Drilling technique.]

BRETT, J. R. Temperature tolerance in young Pacific salmon genus Oncorhynchus. *Journal of the Fisheries Research Board of Canada*, Vol. 9, No. 6, 1952, p. 265–323, illus. [Lethal limits of high and low temperatures determined for young of five species. Experimental methods and results.]

BROCH, HJALMAR. Øreseler. *Norsk Hvalfangst-Tidende*, Årg. 44, Nr. 4, 1955, p. 200–03, illus. [Review and summary of Erling Sivertsen's survey of Eared Seals (family Otariidae) in *Scientific Results of the Norwegian Antarctic Expeditions 1927–28...*, No. 36, 1954. In Norwegian and English.]

BUCKLEY, JOHN L., *and others*. Muskox (*Ovibos moschatus*) longevity, by J. L. Buckley, David L. Spencer, and Paul Adams. *Journal of Mammalogy*, Vol. 35, No. 3, 1954, p. 456. [Born 1930; found dead off Nunivak Island, Alaska, 1953.]

BULLOUGH, K. *and* KAISER, T. R. Radio reflections from aurorae, 2. *Journal of Atmospheric and Terrestrial Physics*, Vol. 6, 1955, p. 198–214, illus. [Auroral echoes recorded at Jodrell Bank, June 1949 and December 1953.]

BURKHANOV, VASILIY FEDOTOVICH. *Novyye sovetskiye issledovaniya v arktike* [*New Soviet investigations in the Arctic*]. Moscow, Gosudarstvennoye Izdatelstvo Geograficheskoy Literatury [State Publishing House for Geographical Literature], 1955. 52 p. illus., maps. 20 cm. [Soviet work in central polar basin up to 1955.]

BURKHANOV, VASILIY FEDOTOVICH. Sovetskiye issledovaniya v arktike [Soviet investigations in the Arctic]. *Vodnyy Transport* [*Water Transport*], 3 November 1955, p. 4. [Soviet plans for Arctic International Geophysical Year stations.]

CASS, W. G. Recent Soviet research on microbiology in the Arctic and other regions. *Nature*, Vol. 177, No. 4510, 1956, p. 654–55. [Synopsis of papers by A. Ye. Kriss on microbiological studies in central polar basin, 1954 and 1955, published in *Vestnik Akademii Nauk SSSR*.]

CHEKUOLIS, A. 16000 kilometrov na rybolovynkh sudakh [16000 km in fishing boats]. *Vokrug Sveta* [*Round the World*], 1956, No. 2, p. 20–24, and No. 3, p. 26–30, illus. [Narrative of voyage of 50 fishing boats through Northern Sea Route from Kaliningrad to Kamchatka, ? 1955.]

CHIASSON, ROBERT B. Dental abnormalities of the Alaskan Fur Seal. *Journal of Mammalogy*, Vol. 36, No. 4, 1955, p. 362–64, illus. [High incidence in 38 random skulls of *Callorhinus ursinus*.]

COOCH, GRAHAM. Techniques for mass capture of flightless Blue and Lesser Snow Geese. *Journal of Wildlife Management*, Vol. 17, No. 4, 1953, p. 460–65, illus. [Eskimo methods used on Southampton Island, Northwest Territories, Canada, summer 1952.]

CRAIN, J. G. MEL. When the Navy ruled Alaska. *United States Naval Institute Proceedings*, Vol. 81, No. 2, 1955, p. 198–203, illus. [Work of Commander L. A. Beardslee, U.S.N., in bringing order to Alaska, 1879.]

CRARY, ALBERT P. Bathymetric chart of the Arctic Ocean along the route of T–3, April, 1952 to October 1953. *International Hydrographic Review*, Vol. 32, No. 1, 1955, p. 165–69, maps. [Results of studies during U.S. Air Force operations on Fletcher's Ice Island, 1952. Reproduced from *Bulletin of the Geological Society of America*, Vol. 65, 1954, p. 709–12.]

CULLEN, J. M. The diurnal rhythm of birds in the arctic summer. *Ibis*, Vol. 96, No. 1, 1954, p. 31–46, illus. [Effect of continuous daylight on various bird activity at Jan Mayen, July–August, 1950.]

CURRIE, B. W. *Prairie provinces and Northwest Territories. Ice. Soil temperatures.* University of Saskatchewan, Physics Department, [1954?]. [i], 28 leaves, illus. 28 cm. [Factors controlling growth, freeze-up and break-up of floating ice; data for Canada; importance of permafrost to agriculture.]

CURRIE, B. W. *Prairie provinces and Northwest Territories. Wind and Storms.* University of Saskatchewan, Physics Department, [1954?]. [i], 41 leaves, illus., maps, 28 cm. [General survey of meteorological data.]

CURTIS, L. COLIN. Observations on mosquitoes at Whitehorse, Yukon Territory (Culicidae : Diptera). *Canadian Entomologist*, Vol. 85, No. 10, 1953, p. 353–70, illus., map. [Data on occurrence and emergence of various species; ecology and development discussed.]

DADYKIN, V. P. V yakutskom filiale (opyty po vozdelyvaniyu kukuruzy) [In the Yakutsk branch (experiments in growing maize)]. *Vestnik Akademii Nauk SSSR* [*Messenger of the Academy of Sciences of the U.S.S.R.*], 1955, No. 7, p. 108–09. [Experiments at Chuchur-Muranskaya biological station, run by this branch of Academy, 1954–55.]

DADYKIN, V. P., *and* TORGOVKINA, YE. YE. Issledovaniya transpiratsii i ovodnennosti list'yev nekotorykh rasteniy tsentral'noy Yakutii [Study of transpiration and hydration of leaves of some plants in central Yakutiya]. *Byulleten' Moskovskogo Obshchestva Ispytateley Prirody. Novaya Seriya. Otdel Biologicheskiy* [*Bulletin of the Moscow Society of Naturalists. New Series. Biological Section*], Tom 60, No. 5, 1955, p. 113–19. [Experiments on wild and cultivated plants in summers of 1952 and 1953.]

DALKIN, T. W. The Alberta mapping project. *Canadian Surveyor*, Vol. 12, No. 4, 1954, p. 265–69. [Account of surveying and mapping of Alberta on scale of 1 : 506,880 by Alberta Department of Lands and Forests, 1949–54.]

DEGE, WILHELM. *Im Packeis gefangen : die Abenteur eines modernen Robinson in der Arktis. 2 Auflage.* Freiburg, Herder, 1953. 138 p. illus., 20 cm. [Experiences of trapper Ole Sivertsen marooned on coast of East Greenland. Reviewed in *Polarforschung*, Bd. 3, Heft 1–2, 1952, p. 210.]

DONOVAN, DESMOND T. The stratigraphy of the Jurassic and Cretaceous rocks of Geographical Society Ø, East Greenland. *Meddelelser om Grønland*, Bd. 103, Nr. 9, 1955, 60 p. illus., maps. [Includes notes on structure and geological history of area; stratigraphical table of Jurassic and Cretaceous of Traill and Geographical Society Øer. Investigations by author in 1952.]

DRINNAN, R. H., *and* PRIOR, L. Physical characteristics of the Ungava Bay area. *Geographical Bulletin* (Ottawa, Department of Mines and Technical Surveys, Geographical Branch), No. 7, 1955, p. 17–37, illus., maps. [From point of view of future development of area. Includes sea ice in Ungava Bay.]

DUNBAR, CARL O. Permian Brachiopod faunas of central east Greenland. *Meddelelser om Grønland*, Bd. 110, Nr. 3, 1955, 169 p. 32 plates, illus., maps. [Permian stratigraphy of area (approx. lat. 70°–76° N.) and systematic palaeontology of shell fossils collected by Danish expeditions under L. Koch, 1926–39.]

ECKSTRØM, K. Hvalkonsesjonsavgiftsfondet. *Norsk Hvalfangst-Tidende*, Årg. 43, Nr. 2, 1954, p. 68–73. [Organization and use of Whaling Concession Fee Fund (fund formed of fees charged for granting whaling concessions in Norwegian waters). In Norwegian and English.]

ELLITSGAARD-RASMUSSEN, K. Features of the geology of the folding range of Peary Land, North Greenland. *Meddelelser om Grønland*, Bd. 127, Nr. 7, 1955, 56 p. illus., maps. [Based on material collected in 1950. Folding and structure, joints, petrography; possible connexion with Svalbard Caledonides.]

ELTON, CHARLES S. Further evidence about the barren ground grizzly bear in northeast Labrador and Quebec. *Journal of Mammalogy*, Vol. 35, No. 3, 1954, p. 345–57, map. [*Ursus richardsoni*; rarity of brown or cinnamon phase of *U. americanus*.]

ENGLAND, M. D., *and others*. Photographic studies of some less familiar birds. LVIII. Lapland Bunting, by M. D. England, H. N. Southern and P. O. Swanberg. *British Birds*, Vol. 47, No. 7, 1954, p. 232–33, illus. [Photographs of *Calcarius lapponicus* in northern Scandinavia.]

FABRICUS, OTTO. Otto Fabricius "on the floating ice in the northern waters". Introduction by Richard H. Dillon. *Geographical Review*, Vol. 45, No. 3, 1955, p. 405–15. [Eighteenth-century translation of observations by early Greenland missionary, (1744–1822). Concerns mainly Davis Strait.]

FISHER, H. D. Delayed implantation in the harbour seal, *Phoca vitulina* L. *Nature*, Vol. 173, No. 4410, 1954, p. 879–80. [Study of reproductive tracts of female seals taken in Nova Scotia and New Brunswick since 1950.]

FITZGERALD, GERALD. Mapping in arctic Alaska. *Canadian Surveyor*, Vol. 11, No. 4, 1953, p. 47–50. [History and progress of mapping by U.S. Geological Survey.]

FRÄNKL, ERDHART. Weitere Beiträge zur Geologie von Kronprins Christians Land (NE-Grönland, zwischen 80° und 80° 30′ N.). *Meddelelser om Grønland*, Bd. 103, Nr. 7, 1955, 35 p. illus., maps. [Geology of area in north-east Greenland (lat. 80°–80° 30′ N., long. 20°–22° W.): field-work in 1953. Discusses value of twin kayak with outboard motor.]

GALAKHOV, N. N. Klimat srednego priangar'ya i basseyna verkhney Leny [Climate of the middle Angara region and the basin of the upper Lena]. *Trudy Instituta Geografii* [*Transactions of the Institute of Geography*], Tom 64, 1955, p. 160–72. [General outline of weather expected in each season of year.]

GALAKHOV, N. N. Mikroklimaticheskiye nablyudeniya v rayonakh srednego priangar'ya basseyna verkhney Leny [Microclimatic observations in the middle Angara region and the basin of the upper Lena]. *Trudy Instituta Geografii* [*Transactions of the Institute of Geography*], Tom 64, 1955, p. 173–92. [Microclimatic profiles of valleys, made in 1950.]

GILLINGHAM, D. W. *Umiak!* London, Museum Press, 1955. 222 p. illus., map. 22 cm. [Author's voyage aboard SS *Baychimo*, Hudson's Bay Company's trader, from Vancouver to Coronation Gulf, 1925. Subsequent fate of ship.]

GODFREY, H., *and others*. Effects of a rock slide on Babine River salmon, by H. Godfrey, W. R. Hourston, J. W. Stokes, and F. C. Withler. *Fisheries Research Board of Canada. Bulletin*, No. 101, 1954, x, 100 p. illus., maps. [British Columbia 1951–52. Losses estimated. Observations made and remedial measures taken.]

GOODWIN, GEORGE G. Southern records for arctic mammals and a northern record for Alfaro's rice rat. *Journal of Mammalogy*, Vol. 35, No. 2, 1954, p. 258. [Seals. *Phoca groenlandica*, Virginia; *Cystophora cristata*, North Carolina; *Halichoerus grypus*, New Jersey.]

GRAINGER, E. H. Station list of the *Calanus* expeditions, 1951–52, together with Frobisher Bay stations, 1948, 1950 and 1951, and Resolution Island stations, 1950. *Journal of the Fisheries Research Board of Canada*, Vol. 11, No. 1, 1954, p. 98–105, maps. [Stations located and their type of work indicated.]

GUNDERSON, H. L., *and others*. Mammal observations at lower Back River, Northwest Territories, Canada, by H. L. Gunderson, W. J. Breckenbridge and J. A. Jarosz. *Journal of Mammalogy*, Vol. 36, No. 2, 1955, p. 254–59. [Results of University of Minnesota-Wilkie Foundation expedition, 1953. Annotated list.]

GUSEV, A. M. Arkticheskiye issledovaniya Morskogo gidrofizicheskogo instituta [Arctic investigations of the Marine Hydrophysical Institute]. *Vestnik Akademii Nauk SSSR* [*Messenger of the Academy of Sciences of the U.S.S.R.*], 1955, No. 2, p. 39–43. [Study of air temperature inversion, of marine electric currents and of phosphorus content of sea water at drifting station in Arctic Ocean, 1954.]

HACHEY, H. B. The hydrography of Hudson Bay. *Transactions of the Royal Society of Canada*, Third Series, Vol. 48, Oceanographic Session, 1954, p. 19–23. [Discussion of circulation, tides and salinities of Hudson Bay.]

HAGLUND, BERTIL. Säljakten. *In: Djur och jakt jorden runt: en antologi om modern jakt...*, del 3, 1954, p. 374–84, illus. [Sealing in Baltic.]

HALE, MASON E. Lichens from Baffin Island. *American Midland Naturalist*, Vol. 51, No. 1, 1954, p. 232–64, illus., map. [Annotated list of species collected summer 1950.]

HANSON, HAROLD C. Inter-family dominance in Canada Geese. *Auk*, Vol. 70, January 1953, p. 11–16. [Observations on social behaviour of *Branta canadensis interior*.]

HARBER, D. D. The birds of the Soviet Union. Under the general editorship of G. P. Dementiev and N. A. Gladkov. (State Publishers "Soviet Science", Moscow, 1951–54). 6 vols. (In Russian). *British Birds*, Vol. 48, 1955; No. 5, p. 218–24; No. 6, p. 268–76; No. 7, p. 313–19; No. 8, p. 343–48; No. 9, p. 404–10; No. 10, p. 447–53; No. 11, p. 505–11. [Comprehensive informative review.]

HARE, F. KENNETH. The boreal conifer zone. *Geographical Studies*, Vol. 40, No. 4, 1950, p. 615–35. [Definition and special features of zone.]

HARPER, FRANCIS. *The barren ground caribou of Keewatin.* Lawrence, University of Kansas, 1955. 163 p. illus., map. 23 cm. [Study of *Rangifer arcticus arcticus* made at Nueltin Lake, southwestern Keewatin, 1947.]

HARPER, FRANCIS. Birds of the Nueltin Lake expedition. *American Midland Naturalist.* Vol. 49, No. 1, 1953, p. 1–116, illus., map. [Species observed and collected, May to December, 1947, Nueltin Lake, Keewatin, Canada.]

HAYA DE LA TORRE, VICTOR RAÚL. Grønland—som en mand fra inkaernes land så det. *Grønland*, 1955, Nr. 9, p. 321–29, port., illus. [Eminent Latin American politician and thinker's view of Danish colonization in Greenland.]

HOFF, ERIK. Den dansk-norske Grønlandsekspedition til Staunings Alper 1954. *Grønland*, 1955, Nr. 8, p. 295–304, illus., map. [Danish–Norwegian mountaineering expedition to Staunings Alper, east Greenland, 1954.]

HOOD, A. D. *An analysis of radar ice reports submitted by Hudson Bay shipping (1953).* Ottawa, National Research Council, Radio and Engineering Division, 1954. ii, 4 leaves, illus., map. 27½ cm. (N.R.C. No. 3301). [Effectiveness of radar in detecting floating ice; amendments suggested to form of ice reports.]

HOWARTH, DAVID. *We die alone.* London, Collins, 1955. 255 p. illus., map. 20½ cm. [Narrative of escape to Sweden by Jan Baalsrud during war in north Norway, 1943.]

HOYTE, H. M. D. Observations on reproduction in some small mammals of arctic Norway. *Journal of Animal Ecology*, Vol. 24, No. 2, 1955, p. 412–25. [Troms. Six species examined during summer 1953. Results of Edinburgh University Expedition.]

HUSTICH, ILMARI. Forest-botanical notes from the Moose River area, Ontario, Canada. *Acta Geographica*, 13, N:o 2, 1955, 50 p. illus., maps. [Tree and bush species; description of 40 sample plots (*c.* 10 × 10 m. each); tree growth; list of vascular plants. Based on studies in 1946, 1947, 1952.]

ILVESSALO, YRJÖ. The forests of Finland. *Bank of Finland Monthly Bulletin*, Vol. 29, No. 6, 1955, p. 20–25, illus., map. [Distribution, growth, policy, since about 1921.]

IRVING, LAURENCE, *and* KROG, JOHN. Body temperatures of arctic and subarctic birds and mammals. *Journal of Applied Physiology*, Vol. 6, No. 11, 1954, p. 667–80. [Studies of 22 species of mammal and 30 species of bird in arctic and subarctic Alaska.]

IRVING, LAURENCE, *and* PANEAK, SIMON. Biological reconnaissance along the Ahlasuruk River east of Howard Pass, Brooks Range, Alaska, with notes on the avifauna. *Journal of the Washington Academy of Sciences*, Vol. 44, No. 7, 1954, p. 201–11, maps. [46 species recorded, June–July 1953].

IVANOV, S. V. Materialy po izobrazitel'nomu iskusstvu narodov Sibiri XIX–nachala XX v. [Material on the visual art of the peoples of Siberia of the 19th and early 20th centuries.] *Trudy Instituta Etnografii im. N.N. Miklukho-Maklaya. Novaya Seriya* [*Transactions of the N.N. Miklukho-Maklay Institute of Ethnography. New Series*], Tom 22, 1954, 838 p. illus. [Detailed study of all types of design on flat surfaces among Siberian peoples.]

IVERSEN, BJØRGULV. Hvalfangsten på Island. *Norsk Hvalfangst-Tidende*, Årg. 44, Nr. 10, 1955, p. 598–602, 605–06, illus. [Icelandic whaling from land station at Hvalfjorden, since 1948. In Norwegian and English.]

JENNOV, J. G. Nordøstgrønlands moskusokser. *Grønland*, 1955, Nr. 2, p. 75–77. [Protection of Musk-ox in Greenland; opposes C. Vibe's view.]

JENSEN, NIELS LYHNE. Scoresbysund-problemer. *Grønland*, 1955, Nr. 8, p. 281–89, illus. [Social conditions and problems of Greenlanders at Scoresbysund colony, east Greenland, settled from Angmagssalik in 1925.]

JÓNSSON, JÓN. Icelandic researches on trawl-caught cod on the west Greenland banks in 1953. *International Commission for the Northwest Atlantic Fisheries, Annual Proceedings*, Vol. 4, 1953–54 (pub. 1954), p. 38–39. [Analysis of samples of cod (*Gadus callarias* L.) caught by Icelandic trawler *Pétur Halldorsson* on Fylla Bank.]

JÓNSSON, JÓN *and others*. Síldarrannsóknir "Ægis" summarið 1954 eftir Jón Jónsson og Unnsteinn Stefánsson. Ásamt lýsingu á síldarleitart æ kjunum eftir Kristján Júlíusson. *Fjölrit Fiskideildar*, Nr. 5, 1955, 41 p. illus., map. [Herring distribution and hydrographic investigations by research vessel *Ægir* in waters north and northeast of Iceland, June–August 1954. English summary.]

JOSET, ALAIN, *and* HOLTZSCHERER, JEAN-JACQUES. Sondages séismiques au Groenland...Troisième partie: détermination des épaisseurs de l'Inlandsis du Groenland. *Annales de Géophysique*, Tome 10, No. 4, 1954, p. 351–81, illus., maps. (*Rapports scientifiques des Expéditions Polaires Françaises*, No. N. 3. 2.) [Methods and results of work done, 1949–51.]

KARAVAYEV, M. N., *and* POPOVA, A. I. Novyye dannyye po sporovo-pyl'tsevym spektram neogenovykh otlozheniy severovostochnoy Azii. [New data on spore and pollen spectra of neogene deposits in north-east Asia.] *Byulleten' Moskovskogo Obshchestva Ispytateley Prirody. Novaya Seriya. Otdel Biologicheskiy* [*Bulletin of the Moscow Society of*

Naturalists. New Series. Biological Section], Tom 60, No. 6, 1955, p. 107–13. [Tree and plant species identified in Tertiary deposits on Aldan river.]

KELLY, C. D., *and* PADY, S. M. Microbiological studies of air masses over Montreal during 1950 and 1951. *Canadian Journal of Botany*, Vol. 32, No. 5, 1954, p. 591–600. [Continental polar and maritime polar air largely encountered. Numbers of bacteria and fungi determined.]

KENYON, KARL W., *and* WILKE, FORD. Migration of the Northern Fur Seal, *Callorhinus ursinus*. *Journal of Mammalogy*, Vol. 34, No. 1, 1953, p. 86–98, illus. [Summary of data accumulated in last ten years. Special reference to seals of Pribilof Islands.]

KETTLEWELL, H. B. D., *and* RAND, B. Elephant seal cow and pup on South African coast. *Nature*, Vol. 175, No. 4466, 1955, p. 1000–01. [First record of female *Mirounga leonina* Linneus on South African coast, found on Bredasdorp coast, October 1953.]

KIELHORN, WILLIAM V. Skijump II. *United States Naval Institute Proceedings*, Vol. 80, No. 10, 1954, p. 1122–30, illus., map. [Narrative of U.S. Navy air expedition to polar basin, 1952.]

KLENOVA, M. V. Nekotoryye rezul'taty i zadachi izucheniya geologii arkticheskogo basseyna [Some results and tasks in the study of the geology of the Arctic basin]. *Vestnik Akademii Nauk SSSR* [*Messenger of the Academy of Sciences of the U.S.S.R.*], 1955, No. 3, p. 61–69. [Includes analysis of sea-bed cores up to 76 cm. long taken by author at drifting station SP–4, August 1954.]

KNUDSEN, ERIK HJORTENBERG. Mens "Jopeter" skrues ned af storisen. *Grønland*, 1955, Nr. 10, p. 379–88, illus., map. [Crushing of M.S. *Jopeter* in east Greenland pack ice, August–September 1955.]

KOCH, B. ESKE. Geological observations on the Tertiary sequence of the area around Atanikerdluk, west Greenland. *Meddelelser om Grønland*, Bd. 135, Nr. 5, 1955, 50 p. illus., map. [Based on field work in 1951 and 1952.]

KORT, V. G. Raboty Instituta okeanologii v arkticheskom basseyne [Work of the Institute of Oceanography in the Arctic Ocean]. *Vesknik Akademii Nauk SSSR* [*Messenger of the Academy of Sciences of the U.S.S.R.*], 1955, No. 1, p. 41–42. [Biological and physical oceanographical investigations by Institute staff at drifting stations SP–3 and SP–4, 1954.]

KRAFT, SALOMON. Nordnorge i de förenade konungarikenas handelstraktater med Ryssland. *Kungl. Vitterhets Historie och Antikvitets Akademiens Handlingar*, Del 88, 1954, 112 p. [North Norway in commercial treaties with Russia during Swedish–Norwegian union (1814–1905), mainly 1817–1860's; effects; commercial relations with Russia. English summary.]

KRAUSKOPF, KONRAD B. Igneous and metamorphic rocks of the Øksfjord area, Vest-Finnmark. *Norges Geologiske Undersøkelse*, Nr. 188, Årbok 1953, 1954, p. 29–50, maps. [Peninsula in north Norway. Based on field-work by author in 1953.]

KRISS, A. YE. Mikrobiologicheskiye issledovaniya v rayone severnogo polyusa [Microbiological investigations in the North Pole region]. *Vestnik Akademii Nauk SSSR* [*Messenger of the Academy of Sciences of the U.S.S.R.*), 1955, No. 1, p. 30–40. [Vertical distribution of bacteria in sea water at drifting station SP–3, July and September 1954.]

KRISS, A. YE. Novyye mikrobiologicheskiye issledovaniya v tsentral'noy arktike [New microbiological investigations in the central Arctic]. *Vestnik Akademii Nauk SSSR* [*Messenger of the Academy of Sciences of the U.S.S.R.*], 1955, No. 9, p. 31–34, map. [Vertical distribution of bacteria in sea water at 15 stations, 1955.]

KROG, JOHN. Notes on the birds of Amchitka Island, Alaska. *Condor*, Vol. 55, No. 6, 1953, p. 299–304, illus. [Observations, May to June 1952.]

KROG, JOHN. Storing of food items in the winter nest of the Alaskan Ground Squirrel, *Citellus undulatus*. *Journal of Mammalogy*, Vol. 35, No. 4, 1954, p. 586. [Case observed on Kotzebue Peninsula, Alaska, 1951.]

KRYPTON, CONSTANTINE. *The Northern Sea Route and the economy of the Soviet north*. New York, Frederick A. Praeger for Research Program on the U.S.S.R., 1956. ix, 219 p. map. 22 cm. (Praeger publications in Russian history and world communism, No. 42.) [Evaluation of Soviet motives in developing Northern Sea Route.]

LANGE, MORTEN. Macromycetes: Part II Greenland Agaricales (Pleurotaceae, Hygrophoraceae, Tricholomataceae, Amanitaceae, Agaricaceae, Coprinaceae, and Strophariaceae). *Meddelelser om Grønland*, Bd. 147, Nr. 11, 1955, 69 p. illus., maps. [Classified list of fungi collected by author in seven localities in south-west Greenland in 1946: description, distribution.]

LE QUINIO, ROBERT. *Cartes météorologiques de l'hémisphère sud entre 30° S et 70° S–70° E et 180°. Cartes quotidiennes des pressions du 1er janvier au 31 décembre 1951 06 00 TU.* Paris, Expéditions Polaires Françaises, 1955. 374 p. 31 cm. (*Expéditions Polaires Françaises, Missions Paul-Emile Victor, Expéditions antarctiques. Résultats scientifiques*, No. S.V.) [Daily pressure charts of Southern Ocean.]

Lee, Millard A. Loran in polar regions. *Navigation*, Vol. 4, No. 8, 1955, p. 323–26, illus. [Plea for loran installations on northern coast of Alaska. Comparison of "Ptarmigan" and "Loon Echo" flights.]

Lefroy, John Henry. *In search of the magnetic north: a soldier-surveyor's letters from the North-West 1843–1844. Edited by George F. G. Stanley.* Toronto, Macmillan, 1955. xxix, 171 p. illus., maps (on end papers). 22 cm. [Written on magnetic survey journeys from Toronto along Slave, Mackenzie, Peace and and North Saskatchewan rivers. Reviewed by R. Glover in *Canadian Historical Review*, Vol. 36, No. 3, 1955, p. 266–67.]

Lepage, Ernest. Nouveautés dans la flore de la Baie James. *Le Naturaliste Canadien*, Vol. 81, No. 12, 1954, p. 255–61. [New forms collected by author in Ontario and Quebec.]

Levine, Norman D. A review of the coccidia from the avian orders Galliformes, Anseriformes and Charadriiformes, with descriptions of three new species. *American Midland Naturalist*, Vol. 49, No. 3, 1953, p. 696–719, tables. [Study of intestinal contents of 49 birds of 21 species from Canadian Northwest Territories.]

Levine, Norman D., *and* Hanson, H. C. Blood parasites of the Canada Goose, *Branta canadensis interior*. *Journal of Wildlife Management*, Vol. 17, No. 2, 1953,p . 185–96, illus. [Study of blood smears from 353 birds.]

Lipshits, B. A. O kollektsiyakh Muzeya antropologii i etnografii, sobrannykh russkimi puteshestvennikami i issledovatelyami na Alyaske i v Kalifornii [Collections in the Musuem of Anthropology and Ethnography collected by Russian travellers and explorers in Alaska and California]. *Sbornik Muzeya Antropologii i Etnografii* [*Collected Papers of the Museum of Anthropology and Ethnography*], Tom 16, 1955, p. 358–69, illus. [Objects of Eskimo, Aleut and Tlingit culture collected by I. G. Voznesenskiy and others, 1785–1891.]

Lister, Hal, *and others*. Sólheimajökull: report of the Durham University Iceland Expedition 1948 by H. Lister, R. Jarvis, M. McDonald, I. W. Paterson and R. Walker. With an introduction by J. Eyþórsson. *Acta Naturalia Islandica*, Vol. 1, No. 8, 1953, 41 p. illus., maps. [South Iceland: survey, geomorphology, glaciology.]

Lord, C. S. Operation Keewatin. *Precambrian*, Vol. 26, No. 4, 1953, p. 26–30, illus., maps. [Geological survey of District of Keewatin with helicopters by Canadian Geological Survey, May–September 1952.]

McEwen, E. H. Sporadic occurrence of an Alaskan Fur Seal. *Journal of Mammalogy*, Vol. 35, No. 3, 1954, p. 444–45. *Callorhinus ursinus* shot in inland lake, north-east Yukon Territory, 1951.]

Major, Harald, *and* Winsnes, Thore S. Cambrian and Ordovician fossils from Sørkapp Land, Spitsbergen. *Norsk Polarinstitutt. Skrifter*, Nr. 106, 1955, 47 p. 5 plates, illus., maps. [Collected by party from Norsk Polarinstitutt in south Vestspitsbergen, 1952.]

Malaurie, Jean. Archéologie eskimo. *Annales de Géographie*, An. 63, No. 336, 1954, p. 157–59. [Summary of archaeologists' views on past Eskimo culture.]

Manker, Ernst, *and* Vorren, Ørnulv. Villreinfangst ved Gollevarre: samiske fangstanlegg for villrein I. *Acta Borealia, B. Humaniora*, No. 2, 1953, 58 p. illus., map. [Wild reindeer hunting at Gollevarre, east Finnmark, north Norway, in former times; details of Lapp network of trapping pits.]

Mansfield, Arthur W. Eastern Arctic fisheries investigations, 1947–55. *Arctic*, Vol. 8, No. 2, 1955, p. 133–35, illus. [Fisheries Research Board of Canada: work of M.V. *Calanus*. Includes details of walrus tagging.]

Margolis, Leo. Notes on the morphology, taxonomy and synonymy of several species of whale-lice (Cyamidae: Amphipoda). *Journal of the Fisheries Research Board of Canada*, Vol. 12, No. 1, 1955, p. 121–33, illus.

Margolis, Leo, *and* Pike, Gordon C. Some Helminth parasites of Canadian Pacific Whales. *Journal of the Fisheries Research Board of Canada*, Vol. 12, No. 1, 1955, p. 97–120, illus. [Recorded from Cetacea captured off British Columbia coast. Systematic list and description.]

Margolis, Leo. Three kinds of whale-lice (Cyamidae: Amphipoda) from the Pacific coast of Canada, including a new species. *Journal of the Fisheries Research Board of Canada*, Vol. 11, No. 3, 1954, p. 319–25, illus. [*Cyamus catodontis* n.sp. described and illustrated.]

Martin, N. V. Limnological and biological observations in the region of the Ungava or Chubb Crater, Province of Quebec. *Journal of the Fisheries Research Board of Canada*, Vol. 12, No. 4, 1955, p. 487–98, illus., maps. [Fish investigations, July–August 1951. Appendix by Jacques Rousseau and Marcel Raymond on flora of "Chubb Crater".]

Mathison, Trygve. De gamle anleggene i Recherchefjorden og Trygghamna. *Norsk Geografisk Tidsskrift*, Bd. 15, Hefte 1–2, 1955, p. 10–19, illus. [Origins of Russian ruins at Recherchefjorden and Trygghamna, Vestspitsbergen; Europeans in Svalbard in seventeenth and eighteenth centuries.]

MAYER, WILLIAM V. A preliminary study of the Barrow Ground Squirrel, *Citellus parryi barrowensis*. *Journal of Mammalogy*, Vol. 34, No. 3, 1953, p. 334–45, illus., map. [Result of field studies, July–August 1951, at Point Barrow, Alaska.]

MEADE, BUFORD K. Preliminary adjustment of Shoran and EPI observations in the Bering Sea. *Journal* [*of the U.S.*] *Coast and Geodetic Survey*, 1953, No. 5, p. 10–11. [Preliminary adjustment of trilateration net for islands in Bering Sea and west coast of Alaska].

MEEK, J. H., *and* McNAMARA, A. G. Magnetic disturbances, sporadic "E", and radio echoes associated with the aurora. *Canadian Journal of Physics*, Vol. 32, No. 5, 1954, p. 326–29, illus. [Observations from several auroral investigations at Saskatoon compared and discussed.]

MEINERTZHAGAN, RICHARD M. Birds in Greenland. *Bulletin of the British Ornithologist's Club*, Vol. 76, No. 2, 1956, p. 17–22. [Mainly observations in Disko Fjord, 1955. Recommendations for bird protection in Greenland.]

MELDGAARD, JØRGEN. Eskimoiske stenalderkulturer i arktisk Canada. *Polarboken*, 1955, p. 113–27, illus., map. [Archaeological expedition to area round Igloolik, Canadian Arctic, 1954, to study Dorset culture remains.]

MELLOR, MALCOLM. University Spitzbergen expedition 1955. *University of Nottingham Survey*, Vol. 6, No. 1, 1955, p. 25–29, illus., map. [Leader's report on Nottingham University glaciological and geological expedition to Kongsfjorden area, Vestspitsbergen, 1955.]

MENARD, HENRY W. Pleistocene and Recent sediment from the floor of the northeastern Pacific Ocean. *Bulletin of the Geological Society of America*, Vol. 64, 1953, p. 1279–94, illus., maps. [Submarine stratigraphic succession. Based on dredge and core samples. Sampling methods discussed.]

MILLER, DON J. Late Cenozoic marine glacial sediments and marine terraces of Middleton Island, Alaska. *Journal of Geology*, Vol. 61, No. 1, 1953, p. 17–40, illus., maps. [Five late Pleistocene to Recent uplifted marine terraces recorded on Pliocene–Pleistocene Bedrock sequence.]

MILLIGAN, G. C., *and* TAKE, W. F. Geology of the eastern Bear Lake area, Oxford Lake mining division, Northern Manitoba. *Province of Manitoba. Department of Mines and Resources. Mines Branch. Publication*, 53–1, 1954, [iv], 51 p. plates (at end), illus., maps (folding at end and two in separate folder). [Results of authors' survey 1951–53.]

MITCHELL, ELAINE ALLAN. The North West Company agreement of 1795. *Canadian Historical Review*, Vol. 36, No. 2, 1955, p. 126–45. [Text and codicils of newly found agreement. History of this and previous agreements.]

MÖLDER, KARL. Kvartäärikautiset jäärkaudet ja interglasiaalikaudet Neuvostoliitossa. *Terra*, Årg. 67, No. 2, 1955, p. 48–55, illus., map. [Quaternary ice ages and inter-glacial periods in the U.S.S.R.: extent and duration of ice, plant growth in inter-glacial periods. Summary in German.]

MÜLLERN, HERMAN. Operation "Büffel": stridsgruppen Feuersteins försök att undsätta de tyska trupperna vid Narvik. *Aktuellt och Historiskt*, 1954 (pub. 1955), p. 108–36, maps. [Operation, in roadless mountain terrain during snow thaw, of combat group Feuerstein to relieve German troops at Narvik, north Norway, spring 1940.]

NABOKOV, M. YE. Solntse v arktike [Sun in the Arctic]. *Geografiya v Shkole* [*Geography in School*], 1955, No. 6, p. 56–59. [Day, twilight, and night at the Poles.]

NEWELL, NORMAN D. Permian pelecypods of East Greenland. *Meddelelser om Grønland*, Bd. 110, Nr. 4, 1955, 36 p. 5 plates. [Description of 23 species of shell fossils from Upper Permian and 3 from Lower Triassic, collected by Danish expeditions under L. Koch.]

NEY, C. H. Control for arctic mapping. *Canadian Surveyor*, Vol. 11, No. 4, 1953, p. 32–35. [Possible methods summarized.]

NICHOLSON, NORMAN L. The boundaries of Canada, its provinces and territories. *Canada. Department of Mines and Technical Surveys. Geographical Branch. Memoir*, 2, 1954, ix, 142 p. illus., maps. [Evolution and location; problems analysed; classification of boundary types; mainly geographical appraisal, but political and economic factors considered.]

NIELSEN, FREDERIK. Nyordningens første landsrådsperiode 1951–55. *Grønland*, 1955, Nr. 7, p. 241–50. [Greenland's provincial council since its establishment in 1950.]

NIELSEN, THOR. *The Zeppelin story: the life of Hugo Eckener, translated from the German by Peter Chambers*. London, Allan Wingate, 1955. 239 p. illus. 23 cm. [English edition of *Eckener. Ein Leben für den Zeppelin*. Chapter 14, p. 190–97, narrates Arctic flight of *Graf Zeppelin*, 1931.]

NIKIFOROV, L. P. O rasprostranenii dikogo severnogo olenya [Distribution of wild reindeer]. *Priroda* [*Nature*], 1955, No. 11, p. 98–100, map. [Parts of Karelo-Finskaya S.S.R. where wild *Rangifer tarandus* are still found.]

NORWICKI, ALBERT L. U.S. mapping in the Arctic and sub-Arctic regions of the western hemisphere. *Canadian Surveyor*, Vol. 11, No. 4, 1953, p. 51–53. [Problems of military mapping.]

NOZAWA, YASUTAKE, *and others*. *Biological investigation of the northern Pacific baleen whales caught by the Japanese whaling fleet in 1953, by Y. Nozawa, Iwao Takayama and Takahisa Nemoto.* Tokyo, Fisheries Agency of Japanese Government, 1954. 52 p. illus. (Issued by the Japan Whaling Association.) [Data for *Mystacoceti*, May–September 1953.]

ØDUM, HILMAR, *and* KOCH, B. ESKE. The Mesozoic sediments of Qeqertarssuaq, Umanak district, west Greenland. *Meddelelser om Grønland*, Bd. 135, Nr. 2, 1955, 14 p. illus., map. [Investigations in 1947. Geology of the area and fossil plants (leaf impressions of *Platanus latiloba* Newb. and undetermined *Cycadophyte*).]

OKLADNIKOV, A. P. *Istoriya Yakutskoy ASSR. Tom 1. Yakutiya do prisoyedineniya k russkomu gosudarstvu* [*History of Yakutskaya A.S.S.R. Volume 1. Yakutiya before union with the Russian state*]. 2nd ed. Moscow, Leningrad, Izdatel'stvo Akademii Nauk SSSR [Publishing House of the Academy of Sciences of the U.S.S.R.], 1955. 432 p. illus., maps. 27 cm. [Stone, bronze and iron age cultures in area; history of Yakut people to seventeenth century.]

OLSEN, INGVARD. Kommandør Hammer in memoriam. *Grønland*, 1955, Nr. 7, p. 266–70, port. [Biographical note on R. R. J. Hammer, surveyor in west Greenland, 1879–80 and 1883.]

OLSEN, INGVARD. De kongelige skibes Grønlandstogter i ældre tid. *Grønland*, 1955, Nr. 9, p. 353–60. [Expeditions by royal Danish vessels to Greenland from 1475 to 1737.]

OOSTEROM, M. G. En hornblenderik sone i Seiland-peridotitten. Föreløbig meddelelse. *Norges Geologiske Undersøkelse*, Nr. 188, Årbok 1953, 1954, p. 51–53, map. [Preliminary notice of hornblende rich zone in peridotite of Seiland, Vest-Finnmark, north Norway. English summary.]

ØSTBY, HARALD. Den norske småhvalfangst. *Norsk Hvalfangst-Tidende*, Årg. 42, Nr. 12, 1953, p. 698–708, illus. [Small whale hunting in Norwegian waters, and its regulation. In Norwegian and English.]

PADGET, PETER. The geology of the Caledonides of the Birtavarre region, Troms, northern Norway. *Norges Geologiske Undersøkelse*, Nr. 192, 1955, 107 p. illus., maps. [Stratigraphy, petrography and structure of a copper bearing area, based on investigations begun in 1952.]

PADY, S. M., *and* KELLY, C. D. Studies on microorganisms in Arctic air during 1949 and 1950. *Canadian Journal of Botany*, Vol. 31, No. 1, 1953, p. 107–22, illus., maps. [Results of samplings at Churchill, Manitoba and during flights in Northwest Territories.]

PAGE, WILLIAM B. Arctic sewer and soil temperatures; how Fairbanks, Alaska, is deicing its sewers. *Water and Sewage Works* (Chicago), July 1955, 5 p. (Reprint.) [Temperature measurements in the sewer system of Fairbanks, Alaska, 1949.]

PATON, HUBERT A. Horizontal and vertical control for arctic mapping. *Canadian Surveyor*, Vol. 11, No. 4, 1953, p. 35–40. [Methods and equipment of U.S. Coast and Geodetic Survey in Alaska.]

PATTERSON, W. S. B. Atmospheric refraction above the inland ice in North Greenland. *Bulletin Géodésique*, No. 38 [1955], p. 42–54, illus. [Based on observations made during British North Greenland Expedition 1952–54.]

PEDERSEN, E. S. The S.A.S. transarctic flights. *Journal of the Institute of Navigation*, Vol. 8, No. 2, 1955, p. 138–44, map. [Scandinavian Airlines System, 1951–54: navigational problems and their solution.]

PETERSON, D. G., *and* BROWN, A. W. A. Studies of the responses of the female *Aëdes* mosquito. Pt. 3. The response of *Aëdes aegypti* (L.) to a warm body and its radiation. *Bulletin of Entomological Research*, Vol. 42, Pt. 3, 1951, p. 535–41, illus.

PIERCE, CHARLES. Datum connection to the Bering Sea islands. *Journal of the U.S. Coast and Geodetic Survey*, 1953, No. 5, p. 3–10, map. [Use of electronic position indicator to establish base net for future charting.]

PITELKA, FRANK A., *and others*. Breeding behaviour of jaegers and owls near Barrow, Alaska, by F. A. Pitelka, P. Quentin Tomich and George W. Treichel. *Condor*, Vol. 57, No. 1, 1955, p. 3–18. [*Stercorarius pomarinus*, *Nyctea scandiaca* and *Asio flammeus*, seasons 1952, 1953.]

PORSILD, A. E. The vascular plants of the western Canadian arctic archipelago. *National Museum of Canada. Bulletin* No. 135, *Biological Series*, No. 45, 1955, iv, 226 p. illus., maps. [Annotated list. Includes sections on physiography, distribution and history of botanical exploration.]

POULSEN, M. FOG. Børnelammelse og vaccination. *Atuagagdliutit/Grønlandsposten*, 1955, nr. 14, p. 5–6, 4, 19, map. [History of poliomyelitis in Greenland; vaccination plans.]

QUAY, W. B. Histology and cytochemistry of skin gland areas in the Caribou, *Rangifer*. *Journal of Mammalogy*, Vol. 36, No. 2, 1955. p. 187–201, illus. [Based on skin samples from two specimens from Alaska.]

QVIGSTAD, J. Opptegnelser fra samenes liv. *Acta Borealia. B. Humaniora*, No. 3, 1954, 63 p. [Stories of Lapp life, told by Lapps. In Norwegian and Lappish.]

RALFS, A. H. The current survey problem in northeastern British Columbia. *Canadian Surveyor*, Vol. 12, No. 4, 1954, p. 242–48, map. [Efforts to establish survey control in Peace River area in connexion with claims to deposits of petroleum and natural gas.]

RAND, ROBERT W. The exploitation of seals on the Pribilof Islands. *Commerce and Industry* (Pretoria), Vol. 13, No. 12, 1955, p. 613–20, illus. [*Callorhinus ursinus.*]

RAPP, ANDERS. En sommarmånad på Spetsbergen: geomorfologiska studier i Tempelfjordsområdet 1954. *Ymer*, Årg. 75, Häfte 2, 1955, p. 121–37, illus., maps. [Narrative and preliminary report of geomorphological work of Uppsala Universitet expedition to Tempelfjorden area of Vestspitsbergen, 1954. English summary.]

RASMUSSEN, BIRGER. Hjelpetjenesten for selfangere i Vesterisen. *Polarboken*, 1955, p. 160–74, illus. [Losses of Norwegian sealing fleet in Vesterisen (Greenland Sea), and development of rescue service 1922–55.]

RASMUSSEN, BIRGER. On the Norwegian pelagic long-line fishery in the Holsteinborg Deep—1953. *International Commission for the Northwest Atlantic Fisheries, Annual Proceedings*, Vol. 4, 1953–54 (pub. 1954), p. 40–45, illus. [Possible relationship between temperature at various depths and number of cod caught. Size and age of *Gadus callarias* L. analysed.]

RASMUSSEN, BIRGER. Selundersøkelser. *Årsberetning vedkommende Norges Fiskerier*, 1952, Nr. 6, [pub. 1955], p. 81–83. [Norwegian investigations of seal stock in Greenland Sea and Newfoundland grounds in 1951–52.]

RASMUSSEN, BIRGER. Undersøkelser over torskebestanden ved Grønland. *Årsberetning vedkommende Norges Fiskerier*, 1952, Nr. 6, [pub. 1955], p. 43–46, illus. [Norwegian investigations on cod stock in waters off west Greenland, 1948–52.]

RAUSCH, ROBERT. Studies on the Helminth fauna of Alaska. XIII. Disease in the sea otter, with special reference to helminth parasites. *Ecology*, Vol. 34, No. 3, 1953, p. 584–604, illus. [Details of helminth species occurrence in *Enhydra lutris* (L.) summarized for 31 animals.]

RAWSON, D. S. The bottom fauna of Great Slave Lake. *Journal of the Fisheries Research Board of Canada*, Vol. 10, No. 8, 1953, p. 486–520, illus., maps. [Distribution and ecology of macroscopic organisms from 600 dredgings, made during summers 1944–47.]

RISTVEDT, PEDER. Minner fra "Gjøa"-ferden: en deltager forteller. *Polarboken*, 1955, p. 21–46, illus. [Recollections of Amundsen's Northwest Passage expedition in *Gjøa*, 1903–06, by member of expedition.]

ROLLEFSEN, GUNNAR, *and others*. Torskefisk ved Gunnar Rollefsen, Gunnar Sætersdal og Birger Rasmussen. *Årsberetning vedkommende Norges Fiskerier*, 1952, Nr. 6, [pub. 1955], p. 29–42, illus. [Cod, haddock and wolf-fish stock investigations in Norwegian and Barents Seas, 1948–52.]

ROPER, J. S. Primary breaking at Snow Lake. *Canadian Mining and Metallurgical Bulletin*, January, 1955, 7 p. illus. (Reprint.) [Methods of mining gold ore in northern Manitoba.]

ROSING, JENS. Norsk tamren på Vestgrønland. *Polarboken*, 1955, p. 147–59, illus. [Reindeer husbandry experiment in west Greenland, 1952–55; horse-fly problem.]

ROSING, JENS. Renvogterliv i Grønland. *Grønland*, 1955, Nr. 6, p. 225–31, illus. [Reindeer husbandry experiment in Greenland: preliminary history; herding difficulties in first months after importation, 1952.]

ROSS, ALAN S. C. Ohthere's "Civenas and lakes". *Geographical Journal*, Vol. 120, Part 3, 1954, p. 337–46, illus., map. [Author's visit to Lapland to investigate water routes of ninth century tribe.]

ROWLEY, DIANA, *ed. Arctic research: the current status of research and some immediate problems in the North American arctic and sub-arctic. Edited by Diana Rowley.* Arctic Institute of North America, 1955. 261 p. illus., maps (one folding at end). 26 cm. (Special Publication No. 2 of the Arctic Institute of North America. Reprinted from *Arctic*, Vol. 7, Nos. 3–4, 1954, p. 113–375.] [Collected papers by experts in various fields.]

RUDBERG, STEN. Some observations on the geology and morphology of the Pältsa region. *Botaniska Notiser*, Supplement, Vol. 3 : 2, [1954?], p. 14–44, illus., map. [Extreme north of Sweden. Based on investigations in 1949; question of whether Pältsa projected as nunatak in former ice ages.]

RUMYANTSEV, N. M. *Pobeda sovetskoy armii v zapolyar'ye. Desyatyy udar (1944 god) [Victory of the Soviet army in the polar regions. The ninth blow (1944)].* Moscow, Voyennoye Izdatel'stvo Ministerstva Oborony Soyuza SSR [Military Publishing House of the Ministry of Defence of the U.S.S.R.], 1955. 104 p. illus., maps, 20 cm. [Soviet account of 1944 campaign in Murmansk-Kirkenes area.]

SAUNDERS, R. A., *and* MACLEAN, W. J. Shoran operations in Canada. Part 1. Shoran survey operational organization. Part 2. Shoran geodetic operations. *Canadian Surveyor*, Vol. 11, No. 6, 1953, p. 13–21, illus. [Part 1. Interrelationship and duties of various detachments. Part 2. Methods and techniques. General principles of line-crossing.]

SAVILE, D. B. O. Notes on boreal Ustilaginales. *Canadian Journal of Botany*, Vol. 31, No. 5, 1953, p. 663–74. [Annotated list of new records of smut fungi, largely from northern Canada and Alaska.]

SCHAUB, H. P. Tectonics and morphology of Kap Oswald (NE-Greenland). *Meddelelser om Grønland*, Bd. 103, Nr. 10, 1955, 33 p. illus., maps. [Based on author's observations on Ella Ø in winter 1936–37.]

SCHEFFER, VICTOR B. Body size with relation to population density in mammals. *Journal of Mammalogy*, Vol. 36, No. 4, 1955, p. 493–515. [Evidence of decrease in body size of Alaska Fur Seal (*Callorhinus ursinus*) in relation to measured increase in population. Comparison with other mammals.]

SCHEFFER, VICTOR B. Conserving the Alaska fur seals. *Proceedings of the Seventh Pacific Science Congress*, Vol. 4, 1949, [pub. 1953], p. 615–20. [*Callorhinus ursinus* in Pribilof Islands.]

SCHEFFER, VICTOR B., *and* WILKE, FORD. Relative growth in the northern fur seal. *Growth*, Vol. 17, 1953, p. 129–45. [Study of increases, by age, of body weight and length, hind flipper length, skull length and width, in *Callorhinus ursinus*.]

SCHELL, I. I. Stability and mutual compensation of relationships with iceberg severity off Newfoundland. *Transactions. American Geophysical Union*, Vol. 33, No. 1, 1952, p. 27–31. [Correlation of Labrador-South Greenland air pressure gradient and Bermuda and Uppsala temperatures with iceberg occurrence off Newfoundland.]

SCHILLER, EVERETT L. Studies on the helminth fauna of Alaska. III. *Hymenolepis kenaiensis* n.sp., a cestode from the Greater Scaup (*Aythya marila nearctica*) with remarks on endemicity. *Transactions of the American Microscopical Society*, Vol. 71, No. 2, 1952, p. 146–49, illus.

SCHILLER, EVERETT L. Studies on the helminth fauna of Alaska. X. Morphological variation in *Hymenolepis horrida* (Von Listow, 1901) (Cestoda : Hymenolepididae). *Journal of Parasitology*, Vol. 36, No. 6, 1952, p. 554–68, illus. [Data obtained from study of series of cestodes from various microtine rodents.]

SCHILLER, EVERETT L. Studies on the helminth fauna of Alaska. XIV. Some cestode parasites of the Aleutian teal (*Anas crecca* L.) with the description of *Diorchis longiovum* n.sp. *Proceedings of the Helminthological Society of Washington*, Vol. 20, No. 1, 1953, p. 7–12, illus.

SCHILLER, EVERETT L. Studies on the helminth fauna of Alaska. XV. Some notes on the cysticercus of *Taenia polyacantha* Leuckart, 1856, from a vole (*Microtus oeconomus operarius* Nelson). *Journal of Parasitology*, Vol. 39, No. 3, 1953, 4 p. illus.

SCHILLER, EVERETT L. Studies on the helminth fauna of Alaska. XVII. Notes on the intermediate stages of some helminth parasites of the sea otter. *Biological Bulletin*, Vol. 106, No. 1, 1954, p. 107–21, illus.

SCHILLER, EVERETT L. Studies on the helminth fauna of Alaska. XVIII. Cestode parasites in young anseriformes on the Yukon delta nesting grounds. *Transactions of the American Microscopical Society*, Vol. 73, 1954, p. 194–201, illus.

SCHOLANDER, P. F., *and others*. Gases in icebergs, by P. F. Scholander, John W. Kanwisher and D. C. Nutt. *Science*, Vol. 123, No. 3186, 1956, p. 104–05. [Oxygen content of samples of icebergs from Labrador coast.]

SCHOLANDER, P. F., *and others*. Studies on the physiology of frozen plants and animals in the arctic, by P. F. Scholander, Walter Flagg, R. J. Hock and Laurence Irving. *Journal of Cellular and Comparative Physiology*, Vol. 42, Supplt. 1, 1953, 56 p. illus. (Reprint.) [Winter survival problems studied at Arctic Research Laboratory, Alaska, 1948.]

SCHYTT, VALTER. Glimtar från Kanadas Nordvästterritorier. *Ymer*, Årg. 75, Häfte 2, 1955, p. 97–115, illus., map. [Impressions from journey in 1954 to Northwest Territories; economy, people. English summary.]

SCOTT, D. M. Experiments with the Harbour Seal, *Phoca vitulina*, a definitive host of a marine nematode, *Porrocaecum decipiens*. *Journal of the Fisheries Research Board of Canada*, Vol. 10, No. 8, 1953, p. 539–47. [Results of infestation experiments, 1947–48, with Atlantic cod (*Gadus callarias* Linn.) parasite.]

SELMER-OLSEN, ROLF. Om norske jordarters variasjon i korngradering og plastisitet. *Norges Geologiske Undersøkelse*, Nr. 186, 1954, 102 p. illus. [Variations in plasticity and grain size in Norwegian soils. 39 diagrams and illustrations. Summary in English.]

SHARP, ROBERT P., *and* RIGSBY, GEORGE P. Some rocks of the central St. Elias mountains, Yukon Territory, Canada. *American Journal of Science*, Vol. 254, No. 2, 1956, p. 110–22, illus., map. [Results of authors' studies of scattered bedrock exposures, summers 1948–49.]

SHUMSKIY, P. A. K izucheniyu l'dov severnogo ledovitogo okeana [Study of the ice of the Arctic Ocean]. *Vestnik Akademii Nauk SSSR* [*Messenger of the Academy of Sciences of the U.S.S.R.*], 1955, No. 2, p. 33–38. [Stratification and crystal size of 3 m. vertical section of sea ice at drifting station SP-3, July 1954.]

SIIVONEN, LAURI, *and* KOSKIMIES, JUKKA. Population fluctuations and the lunar cycle. *Papers on Game Research,* 14, 1955, 22 p. illus. [Hypothesis for cause of three to four, and ten-year, fluctuation in animal numbers near arctic circle in Finland.]

SKINNER, L. B. Map nomenclature. *Canadian Surveyor*, Vol. 12, No. 4, 1954, p. 274–77. [Secretary's account of work and policy of Canadian Board on Geographic Names.]

SMED, JENS. Monthly anomalies of the surface temperature in areas of the northern North Atlantic in 1952. *Annales Biologiques*, Vol. 9 (1952), [pub. 1953?], p. 16–19, illus. [Tabulated observations by Danish ships.]

SMED, JENS. Monthly anomalies of the surface temperature in areas of the northern North Atlantic in 1953. *Annales Biologiques*, Vol. 10 (1953), 1954, p. 15–16, illus. [Tabulated observations from Danish and Icelandic ships.]

SMED, JENS. Variation of the surface temperature in the northern North Atlantic during 1876–1952. *Annales Biologiques*, Vol. 9 (1952), [pub. 1953?], p. 19–20. [Tabulated data.]

SMITH, F. C. G. Charting northern seas and harbours. *Canadian Surveyor*, Vol. 11, No. 4, 1953, p. 40–42. [Dominion Hydrographer's report on progress and difficulties.]

SØNDERGAARD, L. Electricitetsforsyningen i Grønland. *Grønland*, 1955, Nr. 8, p. 290–94, illus. [Electricity supply in Greenland.]

SØRENSEN, JANUS. Den grønlandske lods. *Grønland*, 1955, Nr. 7, p. 251–57, illus., map. [Work of Garde (1895), Riis-Carstensen (1948) and others on sailing directions for west Greenland waters.]

STEERE, WILLIAM C. Bryophyta of arctic America. VI. A collection from Prince Patrick Island. *American Midland Naturalist*, Vol. 53, No. 1, 1955, p. 231–41. [Collected summer 1949.]

STEFÁNSSON, UNNSTEINN. Temperature variations in the north Icelandic coastal area. *Rit Fiskideildar*, 2. Bindi, Nr. 2, (1954, Nr. 1), 27 p. illus., maps. [Sea water. About 1875–1950.]

STEFÁNSSON, UNNSTEINN. Yfirborðshiti sjávar við strendur Íslands árin 1949–1953. *Fjölrit Fiskideildar*, Nr. 4, 1954, 29 p. illus., map. [Surface temperature in Icelandic coastal waters, 1949–53. English summary.]

STEVEN, D. M. Small mammal communities of the north Scandinavian birch forest. *Journal of Animal Ecology*, Vol. 24, No. 2, 1955, p. 403–11, illus. [Troms: six species analysed according to habitat. Results of Edinburgh University Expedition, 1953.]

STEWART, N. C. British Columbia provincial boundaries. *Canadian Surveyor*, Vol. 12, No. 2, 1954, p. 75–96, illus., map. [History of evolution and demarcation of northern and eastern boundaries. Bibliography p. 94–95.]

STRENZKE, K., *and others*. *Microfaune du sol de l'Eqe, Groenland. Vol. 1, Arachnides, par K. Strenzke, H. de Lesse and J. Denis.* Paris, Hermann, 1955. [92] p. illus. map. 25½ cm. (*Actualités scientifiques et industrielles* 1232. *Expéditions Polaires Françaises, Missions Paul-Emile Victor*, 7.) [Annotated list of Arachnida collected by Hubert de Lesse, summer 1949. Partly in German.]

SUTTON, GEORGE M., *and* PARMELEE, DAVID F. The Peregrine Falcon on Baffin Island. *Bird Banding*, Vol. 26, 1955, p. 147–52, illus. [*Falco peregrinus* studied in 1953.]

SVERDRUP, HARALD ULRIK. The existence of a submarine ridge crossing the polar sea, predicted by J. E. Fjeldstad in 1936. *Norsk Geografisk Tidsskrift*, Bd. 15, Hefte 1–2, 1955, p. 76–77. [Lomonosov Ridge.]

TAYLOR, ANDREW. Geographical discovery and exploration in the Queen Elizabeth Islands. *Canada. Department of Mines and Technical Surveys, Geographical Branch, Memoir*, 3, 1955, viii, 172 p. maps. [Summary of exploring and administrative expeditions chronologically arranged to 1938, but including voyages of *St. Roch* and Danish Thule and Ellesmere Island expeditions. Bibliography, p. 132–61. Many maps.]

TAYLOR, R. F. Forest research possibilities in Alaska's interior. *In: Science in Alaska: proceedings, Second Alaskan Science Conference, Alaska Division, American Association for the Advancement of Science, Mt. McKinley National Park, September 4–8, 1951.* [College, American Association for the Advancement of Science, Alaska Division, 1953], p. 61–65. [Need for survey to determine area and quality ofi nterior forests.]

THOMSON, JOHN W. Lichens of arctic America. 1. Lichens from west of Hudson's Bay. *Bryologist*, Vol. 56, No. 1, 1953, p. 8–36. [Report on author's collection near Churchill, 1950. Annotated list of species.]

TIKHOMIROV, B. A. O vliyanii zhivotnykh na rastitel'nost' Taymyrskoy tundry [On the influence of animals on the Taymyr tundra]. *Byulleten' Moskovskogo Obshchestva Ispytateley Prirody. Novaya Seriya. Otdel Biologicheskiy* [*Bulletin of the Moscow Society of Naturalists. New Series. Biological Section*], Tom 60, No. 5, 1955, p. 147–51, illus. [Effects attributable to lemmings, ptarmigan and geese.]

TRANS, PETER. Report from the weather service. *Meddelelser om Grønland*, Bd, 127, Nr. 6, 1955, 41 p. illus., maps. [Weather during summer in northeast Greenland, based on observations at Danish Peary Land expedition's (1947–50) weather station at Zackenberg, lat. 74° 30′ N.]

TRICART, JEAN. Données nouvelles sur l'Articque [*sic*] tirées des récentes expéditions soviétiques. *Revue de Géomorphologie Dynamique*, 6 Année, No. 3, 1955, p. 125–33, maps. [Survey of floor of Arctic Ocean. French extract from article in *Izvestiya Akademii Nauk SSSR, Seriya Geograficheskaya*, 1954, No. 5, p. 3–16.]

TRUMPY, B., *and others*. *A magnetic survey of Norway II by Magnetisk Byrå, Bergen, Professor, dr. B. Trumpy, and Norges Sjøkartverk, Oslo, Director Rolf Kjær* [*and J. J. Orlin*]. Bergen and Oslo, Magnetisk Byrå og Norges Sjøkartverk, 1955. 36 p. maps, 31½ cm. (Jordmagnetiske Publikasjoner Nr. 2). [Based on about 1000 stations. Measurements made in 1942, 43, 46, 47, 48, 49, 50.]

TYRTIKOV, A. P. Rastitel'nost' nizov'yev r. Yany [Vegetation of the lower reaches of the river Yana]. *Byulleten' Moskovskogo Obshchestva Ispytateley Prirody. Novaya Seriya. Otdel Biologicheskiy* [*Bulletin of the Moscow Society of Naturalists. New Series. Biological Section*], Tom 60, No. 5, 1955, p. 135–46, illus. [General description, based on published sources and author's own field work.]

UDINTSEV, G. B. Proiskhozhdeniye rel'yefa dna Okhotskogo morya [Origin of the bottom relief of the Okhotsk Sea]. *Trudy Instituta Okeanologii* [*Transactions of the Institute of Oceanography*], Tom 13, 1955, p. 5–15, maps. [Geological structure.]

USHAKOV, P. V., *and others*. *Atlas bespozvonochnykh dal'nevostochnykh morey SSSR* [*Atlas of invertebrates of the Far Eastern Seas of the U.S.S.R.*] [Compiled by P. V. Ushakov and 30 others.] Moscow, Leningrad, Izdatel'stvo Akademii Nauk SSSR [Publishing House of the Academy of Sciences of the U.S.S.R.], 1955. 244 p. illus., maps. 29 cm. [Systematic list of species found in Bering and Okhotsk Seas.]

VAN HAUEN, MAC. Flyvemaskinen i Grønlands kysttrafik. *Grønland*, 1955, Nr. 10, p. 389–96, illus. [Need for coastal air communications in Greenland; detailed proposals for route Umanak-Julianehåb; estimated costs.]

VAN STONE, JAMES W. Coastal manifestations of the Arctic Woodland culture. *In: Science in Alaska: proceedings, Second Alaskan Science Conference, Alaska Division, American Association for the Advancement of Science, Mt. McKinley National Park, September 4–8, 1951.* [College, American Association for the Advancement of Science, Alaska Division, 1953], p. 228–31. [Archaeological and dendrochronological investigations in Kotezebue area by J. L. Giddings *jr.* and author since 1941.]

VIBE CHRISTIAN. Syg i ødemarken. *Grønland*, 1955, Nr. 10, p. 370–78, illus. [Difficulties of evacuating the sick in Greenland wilds: acquisition of ambulance aeroplane advocated.]

VISHNEVSKIY, B. N. Zamechatel'nyy issledovatel' severo-zapadnoy Ameriki: o puteshestviyakh K. T. Khlebnikova v nachale XIX veka [A remarkable explorer of north-west America: on journeys of K. T. Khlebnikov at the beginning of the 19th century]. *Priroda* [*Nature*], 1955, No. 12, p. 59–61. [Khlebnikov (1780–1838) travelled widely in Siberia, Kamchatka and Alaska and became Director of the Russian-American Company.]

VOKES, F. M. Observations at Raipas mine, Alta, Finnmark. *Norges Geologiske Undersøkelse*, Nr. 191, Årbok 1954, 1955, p. 103–14, maps. [Geology of copper mine in north Norway, based on field-work in 1954.]

WATTUM, CONRAD. De nye avdelingene for sjøfart, hvalfangst og arkeologi ved Vestfold Fylkesmuseum. *Norsk Hvalfangst-tidende*, Årg. 42, Nr. 10, 1953, p. 580–83, 585–89, illus. [New seafaring, whaling, and archaeological sections at Vestfold (Norway) Fylkesmuseum, opened 1953. In Norwegian and English.]

WAUGH, B. W. Arctic mapping. *Canadian Surveyor*, Vol. 11, No. 4, 1953, p. 44–47. [Surveyor General's report on preparation of maps of Canadian Arctic.]

WIBORG, KR. FR. Plankton. *Årsberetning vedkommende Norges Fiskerier*, 1952, Nr. 6, [pub. 1955], p. 20–28, illus., map. [Norwegian zooplankton investigations in Norwegian Sea, including those at Eggum and Skrova in Lofoten, 1948–52.]

WILLAN, T. S. *The early history of the Russia Company, 1553–1603*. Manchester, Manchester University Press, 1956. x, 295 p. plate, folding map. 22 cm. 30*s*. [Also called the Muscovy Company.]

WINSNES, THORE S. Norsk Polarinstitutt: en orientering. *Polarboken*, 1955, p. 181–86, illus. [History and work of Norsk Polarinstitutt (formerly Norges Svalbard- og Ishavsundersøkelser), 1928–55.]

WINTER, G., *and* NUNN, W. The component fatty acids of Elephant Seal oil: variations and relationship to blubber fats of other seals. *Journal of the Science of Food and Agriculture*, 1953, No. 9, p. 442–48. [Seals from Heard and Macquarie Island examined: no distinct difference among species.]

WINTER, G., *and* NUNN, W. The composition of the blubber fat of the Crabeater Seal. *Journal of the Science of Food and Agriculture*, 1953, No. 9, p. 439–42. [*Lobodon carcinophagus*. Method and results.]

WITZIG, EMIL. Stratigraphische und tektonische Beobachtungen in der Mesters Vig-Region (Scoresby Land, Nordostgrönland). *Meddelelser om Grønland*, Bd. 72, Anden Afdeling, Nr. 5, 1954, 26 p. illus., maps. [Statigraphy and tectonics in Mesters Vig area, north-east Greenland. Danish geological work in 1947–54. English summary.]

WOODWARD, E. L., *and* BUTLER, ROHAN, *editors*. *Documents on British foreign policy 1919–1939. First Series, Vol. 5, 1919.* London, H.M. Stationery Office, 1954. lvii, 1065 p. 24½ cm. £3. 10*s*. 0*d*. [Reproduces texts of minutes, correspondence and memoranda relating to Spitsbergen Commission at Paris in 1919, p. 42–50, 195–97, 210–14, 219–28, 291, 299–300, 339–40, 363–64.]

ZHUZE, A. P. O diatomovykh tretichnogo vozrasta v donnykh osadkakh dal'nevostochnykh morey [Tertiary diatoms in bottom deposits of the Far Eastern seas]. *Trudy Instituta Okeanologii* [*Transactions of the Institute of Oceanography*]. Tom 9, 1954, p. 119–35, illus. [Species found in Okhotsk and Bering Seas about 1952.]

ZIKEEV, NINA A. Selected annotated bibliography on synoptic meteorology of the Arctic. *Meteorological Abstracts and Bibliography*, Vol. 7, No. 1, 1956, p. 79–146. [225 abstracts arranged chronologically and classified by Universal Decimal Classification.]

ZOTIN, M. O dreyfe nauchnykh stantsiy v tsentral'noy arktiki [Drift of scientific stations in the central Arctic]. *Morskoy Flot* [*Merchant Fleet*], 1955, No. 11, p. 26–28, illus., map. [Analysis of course of drift of Soviet stations SP-2, SP-3, SP-4 and SP-5, 1950–55.]

[ALASKA : RAIN.] *Rainfall intensity-duration-frequency curves for selected stations in the United States, Alaska, Hawaiian Islands, and Puerto Rico.* Washington, D.C., U.S. Department of Commerce, Weather Bureau, 1955, 53 p. illus. 26 cm. [Data for Fairbanks and Juneau, 1931–50.]

[CANADA : FRESH WATER FISHERIES.] Great Slave Lake project. *Annual Report of the Fisheries Research Board of Canada*, 1952, p. 77–79. [Progress report on investigation of fishery prospects. No appreciable decline in fish population from limited commercial fishing.]

[CANADA : MINING COMPANIES.] *Liste des principaux exploitants et propriétaires de mines et de carrières dans la province de Québec.* Quebec, Ministère des Mines, 1956. 78 p. [List of principal operators and owners of mines and quarries in Quebec.]

[CANADIAN ARCTIC : MANOEUVRES.] Army exercises in the north, 1953–4. *Arctic Circular*, Vol. 7, No. 4, 1954, p. 54–55. [Exercise Bull Dog 1 and 2; Exercise Loup Garou.]

[DELPHINIDAE : ALASKA.] Occurrence of the harbor porpoise at Point Barrow, Alaska. *Journal of Mammalogy*, Vol. 35, No. 1, 1954, p. 122–23. [2 specimens of *Phocoena vomerina*, captured August 1952.]

[EXPEDITIONS : ARCTIC.] Edinburgh University expedition to arctic Norway, 1953. *Scottish Geographical Magazine*, Vol. 70, No. 2, 1954, p. 95. [Summary of work done, Lyngen peninsula.]

[GREENLAND : ADMINISTRATION.] Grønlands landsråds forhandlinger 1955. *Beretninger vedrørende Grønland*, 1955, Nr. 2, 301 p. [Proceedings of Greenland provincial council 1955; provincial and municipal finances and budget proposals, 1953–56.]

[GREENLAND : NUTRITION SURVEYS.] Nogle orienterende undersøgelser af grønlandske levnedsmidler og kostforhold. *Grønland*, 1955, Nr. 3, p. 88–101, illus. [Food and nutrition studies carried out by Danish Statens praktisk-sundhedsmæssige Undersøgelser og Statens Vitaminlaboratorium.]

[GREENLAND : PUBLIC ADMINISTRATION.] Vi er endnu kun ved begyndelsen af opbygningen i Grønland. *Atuagagdliutit/Grønlandsposten*, 1955, nr. 16, p. 5–8. [Speeches on Greenland policy by governor (P. H. Lundsteen) and Danish minister of Interior and Housing (J. Kjærbøl) at opening of new Greenland provincial council, 1955.]

[GREENLAND. UNIVERSITETETS ARKTISKE STATION.] Scientific work at the Danish Arctic Station, summer 1954. *Arctic*, Vol. 8, No. 2, 1955, p. 135–36. [Work of Ulrick Røen and others at Godhavn.]

[NORTHWEST TERRITORIES.] *Industries of the Northwest Territories.* Canada. Department of Resources and Development, Northern Administration and Lands Branch, 1953. 36 p. illus. 25 cm. [Comprises mining, fur trade, fisheries, water power, agriculture, reindeer industry, Eskimo handicrafts and lumbering.]

[NORWAY : MAGNETIC CHARTS.] *Kart over magnetisk misvisning i Norge pr. 1 juli 1951.* Bergen, Det Norske Institutt for Kosmisk Fysikk, [1951?]. Map. [Magnetic variation in Norway as on 1 July 1951.]

[REINDEER HUSBANDRY : MURMANSKAYA OBLAST'.] Report from the tundra. *Soviet Union* (Moscow), No. 1 (71), 1956, p. 28–29, illus. [Photographs of reindeer collective farm at Lovozero.]

[SEALING INDUSTRY : ARCTIC.] Beretning om selfangsten, håkjerringfisket og overvintringsekspedisjonen i 1954. *Årsberetning vedkommende Norges Fiskerier*, 1954, Nr. 10, [pub. 1955], 24 p. illus. [Norwegian Arctic sealing, hunting and Greenland-shark fishing, 1954.]

[SHIPS : ARCTIC.] Ships, men and ice. *United States Naval Institute Proceedings*, Vol. 80, No. 2, 1954, p. 198–209, illus. [Film *Ships, men and ice* made by U.S. Naval Photographic Center and released 1954. Illustrates historical development of ships fitted for Arctic voyages.]

[SNOW SURVEYS : BRITISH COLUMBIA.] *Summary of snow-survey measurements in British Columbia, 1935 to 1952 inclusive.* Victoria B.C., Water Rights Branch, Department of Lands and Forests, 1952. viii, 42 p. tables, maps.

[SURVIVAL.] Hvis ulykken skulle ske.... *Atuagagdliutit/Grønlandsposten*, 1955, nr. 22, p. 17. [Survival exercise by Scandinavian Airlines System personnel near Hemavan, north Sweden, February 1955.]

[SVALBARD : TRAVEL GUIDE.] *En reise til Svalbard.* Tromsø, Troms Fylkes Dampskibsselskap, [1955?]. 20 p. illus. 20½ cm. [Guide to Svalbard issued by north Norwegian shipping company.]

[TERMINOLOGY.] *Glossary of arctic and subarctic terms.* Maxwell Air Force Base, Alabama, Arctic, Desert, Tropic Information Center Research Studies Institute, 1955. viii, 90 p. 26 cm. (ADTIC Publication A–105.)

[U.S.S.R. KOMISSIYA PO PROBLEMAM SEVERA.] Ob usilenii nauchno-issledovatel'skikh rabot po sovetskomu severu [On strengthening research work on the Soviet north]. *Vestnik Akademii Nauk SSSR* [*Messenger of the Academy of Sciences of the U.S.S.R.*], 1955, No. 2, p. 85–86. [Terms of reference and plans of Komissiya po problemam severa [Commission for Northern Problems] set up by Akademiya Nauk SSSR [Academy of Sciences of U.S.S.R.] in 1954.]

[WEATHER SHIPS.] North Atlantic Ocean weather stations. *Marine Observer*, Vol. 24, No. 165, 1954, p. 163–66, map. [Decisions on weather ships at 4th North Atlantic Ocean Station Conference, Paris, February 1954.]

[WHALING INDUSTRY : ARCTIC.] Den norske småhvalfangsten i sesongene 1953 og 1954. *Norsk Hvalfangst-Tidende*, Årg. 44, Nr. 3, 1955, p. 135–38, map. [Norwegian small whale hunting in Norwegian and Barents Seas, 1953, and 1954. In Norwegian and English.]

ANTARCTIC

ANDREWS, JAMES. *The cancellations of the Falkland Islands and Dependencies and the handstruck stamps; with notes on the British, Argentine and Chilean post offices in the Antarctic.* London, Robson Lowe, 1956. viii, 56 p. illus., maps. 25 cm. 20*s*.

AUER, VÄINÖ. Suomalainen tutkimus Tulimaassa ja Patagoniassa. *Terra*, Årg. 66, No. 1, 1954, p. 1–21, illus. maps. [Finnish glaciological, botanical and geological expeditions to Patagonia and Tierra del Fuego in 1928, 1937–38 and 1946–53 for palaeoclimatological study.]

BÉCHERVAISE, JOHN. Birds of Heard Island. *Victorian Naturalist*, Vol. 71, 1954, p. 71–74, illus.

BLANC, MAURICE. Poissons recueillis aux îles Kerguelen par P. Paulian (1951) et M. Angot (1952). *Bulletin du Muséum National d'Histoire Naturelle* (Paris), 2e série, T. 26, No. 2, 1954, p. 190–93. [Descriptions of eight species.]

BOGEN, HANS S. I. Compania Argentina de Pesca S. A. *Norsk Hvalfangst-Tidende*, Årg. 44, Nr. 2, 1955, p. 88–92, 95. [Rectifications and additions to author's article in *Norsk Hvalfangst-Tidende*, Årg. 43, Nr. 10, 1954, on history of South Georgia whaling company founded in 1904; catch statistics 1904–54. In Norwegian and English.]

BONNER, W. NIGEL. Reproductive organs of foetal and juvenile Elephant Seals. *Nature*, Vol. 176, No. 4490, 1955, p. 982–83, illus. [Based on material collected in 1953–55 in South Georgia.]

BOURLIÈRE, FRANÇOIS, *and* PRÉVOST, JEAN. Le cycle sexuel paradoxal de l'*Aptenodytes forsteri*. *Société de Biologie. Comptes rendus des séances*, (Paris), Tome 147, Décembre 1953, p. 1893. [Comparison of sexual cycles of *Aptenodytes forsteri* and *Pygoscelis adeliae*, in Terre Adélie. Monthly weights of testes of these two penguins.]

BOURNE, W. R. P. On the status and appearance of the races of Cory's Shearwater *Procellaria diomedea*. *Ibis*, Vol. 97, No. 1, 1955, p. 156–58. [Concludes that there is no distinct southern race and that the two specimens sent back by Ross from Iles de Kerguelen in 1841 were wrongly labelled for locality.]

BUDKER, PAUL. Le marquage des baleines. *Mammalia*, Tome 19, No. 4, 1955, p. 464–69, map. [Summary of progress in whale marking in the Antarctic by various nations.]

BUNT, JOHN S. The importance of bacteria and other microorganisms in the sea-water at Macquarie Island. *Australian Journal of Marine and Freshwater Research*, Vol. 6, No. 1, 1955, p. 60–65. [Experiments on decomposition of giant kelp (*Durvillea antarctica* (Cham.) Hariot), 1951–52. Importance as indirect form of food for seals and birds.]

BUNT, JOHN S. Living and fossil pollen from Macquarie Island. *Nature*, Vol. 177, No. 4503, 1956, p. 339. [Comparison of past and present vascular flora from study of lignite samples collected by author in 1951.]

Bunt, John S., *and* Rovira, A. D. Microbiological studies of some subantarctic soils. *Journal of Soil Science*, Vol. 6, No. 1, 1955. p. 119–28, tables. [Study of soil samples from four plant associations on Macquarie Island.]

Bunt, John S. A note on the faecal flora of some antarctic birds and mammals at Macquarie Island. *Proceedings of the Linnean Society of New South Wales*, Vol. 80, Pt. 1, 1955, p. 44–46. [Based on material collected in 1951–52.]

Bunt, John S. The soil-inhabiting nematodes of Macquarie Island. *Australian Journal of Zoology*, Vol. 2, No. 2, 1954, p. 264–74. [Investigations in 1951–52.]

Burkhanov, Vasiliy Fedotovich. K voprosu issledovaniya antarktiki [On Antarctic research]. *Morskoy Flot* [*Merchant Fleet*], No. 12, 1955, p. 25–28. [International Geophysical Year programme of Soviet Antarctic parties.]

Burkhanov, Vasiliy Fedotovich. Towards the South Pole. *Soviet Union* (Moscow), No. 11 (69), 1955, p. 24–25, illus. [Preparations of Soviet Antarctic expedition for International Geophysical Year.]

Costa, Jean F. da. *La politique australe de la France: notes d'histoire diplomatique et sud-* [*sic*] *antarctique* Paris, A. Pedoue, 1953. 50 p. 24 cm. (Reprinted from *Revue d'Histoire Diplomatique*, No. 2, 1952, Nos. 1, 2, 1953.) [History of French claims in Antarctica and sub-antarctic islands.]

Davies, D. H. The South African pilchard (*Sardinops ocellata*): bird predators 1953–4. *Commerce and Industry*, Vol. 13, No. 3, 1954, p. 241–72, illus. (S. Africa, Dept. of Commerce and Industries, Division of Fisheries, Investigational Report, No. 18.) [Feeding habits of Jackass Penguin (*Spheniscus demersus*) p. 261–64.]

Dodge, Carroll W., *and* Rudolph, E. D. Lichenological notes on the flora of the antarctic continent and the subantarctic islands. I–IV. *Annals of the Missouri Botanical Garden*, 42, 1955, p. 131–49, illus. [Based on collections made on Heard and Macquarie Islands and at Mawson, Australian Antarctic Territory.]

Dolgushin, L. D. V krayu ledyanogo bezmolviya [To the land of icy silence]. *Nauka i Zhizn'* [*Science and Life*], 1955, No. 12, p. 26–28. [Plans for Soviet Academy of Sciences Antarctic expedition, 1955–59.]

Downes, M. C., *and others*. Banding of Giant Petrels at Heard and Macquarie Islands, by M. C. Downes, A. M. Gwynn and P. F. Howard. *Emu*, Vol. 54, Pt. 4, 1954, p. 257–62, map. [Banding and recoveries of *Macronectes giganteus* 1951–54; significance.]

Ealey, E. M. H. Analysis of stomach contents of some Heard Island birds. *Emu*, Vol. 54, Pt. 3, 1954, p. 204–10, illus., table.

Essen, Reinhold von. Aircraft in the Antarctic. *Flight*, 29 October, 1954, p. 655, illus. [Swedish air survey during Norwegian–British–Swedish Antarctic Expedition, 1949–52.]

Fauvel, Pierre. Annélides polychètes recueillies aux îles Kerguelen par le Docteur Arétas et polychètes du muséum de la même provenance. *Bulletin du Muséum d'Histoire Naturelle* (Paris), 2e série T. 29, No. 3, 1952, p. 294–301. [*Annelida* collected in 1949–50.]

Fauvel, Pierre. Une petite collection d'annélides polychètes des îles Kerguelen. *Bulletin du Muséum d'Histoire Naturelle* (Paris), 2e série, T. 25, No. 3, 1953, p. 307–10. [*Annelida* collected in 1952.]

Hamilton, J. E. Scent of Otariids. *Nature*, Vol. 177, No. 4515, 1956, p. 900. [Possible attractive value to females of distinctive odour of adult male *Arctocephalus australis* and *Otaria byronia*.]

Hernandez, Roberto P. J., *and* Besada, Eduardo M. Mediciones geomagnéticas en Isla Decepción. *Meteoros*, Año 5, Nos. 1–2, 1955, p. 55–86, illus., maps. [Results of geomagnetic observations, April–December 1951, at Argentine base at Deception Island, South Shetland Islands.]

Howard, P. F. Banding of the Black-browed Albatross at Heard Island and Macquarie Island. *Emu*, Vol. 54, Pt. 4, 1954, p. 256. [Banding and recoveries of *Diomedea melanophris* 1949–54.]

Hylen, Arvid, *and others*. Foreløpig meddelelse on alderssammensetningen i de antarktiske fangster av finnhval 1945/46 til 1952/53 og noen tanker om finnhvalens totale dødelighet av Arvid Hylen, Åge Jonsgård, Gordon C. Pike og Johan T. Ruud. *Norsk Hvalfangst-Tidende*, Årg. 44, Nr. 10, 1955, p. 577–89, illus. [Preliminary report on age composition of antarctic Fin whale catches 1945–46 to 1952–53 and reflections on total mortality rates of Fin whales. In Norwegian and English.]

Jouanin, Chr., *and* Paulian, Patrice. Migrateurs continentaux dans les îles Nouvelle-Amsterdam et Kerguelen. *L'Oiseau* (Paris), Vol. 24, 2e tr., 1954, p. 136–42. [Bird migration to Iles de Kerguelen and Ile Amsterdam.]

La Grange, J. J. The influence of orographic cloud on sunshine at Marion Island. *News Letter*, (Pretoria, Weather Bureau), No. 79, 1955, p. 3, illus. [Significant irregularities noted in observations, 1948–54.]

Lamb, H. H., *and* Britton, G. P. General atmospheric circulation and weather variations in the Antarctic. *Geographical Journal*, Vol. 121, Part 3, 1955, p. 334–49, illus., maps. [Hypothesis of permanent glacial anti-cyclone reconsidered.]

LAWS, RICHARD M. The elephant seal (*Mirounga leonina* Linn.). 2. General, social and reproductive behaviour. *Falkland Islands Dependencies Survey Scientific Reports*, No. 13, 1956, 88 p. 7 plates, maps. [Biological study in South Georgia and South Orkney islands, 1948–51.]

LAWS, RICHARD M. Giant ovaries of a Blue Whale. *Nature*, Vol. 173, No. 4412, 1954, p. 1003, illus. [131 lbs. combined weight from *Balaenoptera musculus* caught during Antarctic whaling season 1953–54.]

LEES, T. ORDE. The "Endurance" story. *Antarctic News Bulletin*, No. 19, 1955, p. 13–15. [Narrative by member of E. H. Shackleton's British Imperial Trans-Antarctic expedition, 1914–17, from sinking of *Endurance*.]

LÉPINEUX, GEORGES. *Les observations météorologiques de Pointe Géologie en Terre Adélie, 66° 40′ S.–140° 01′ E.–altitude 14 m. Conditions atmosphériques en surface et en altitude du 18 février 1952 au 30 décembre 1952. Relevés quotidiens et moyennes par Georges Lépineux.* Paris, Expéditions Polaires Françaises, 1955. [vi], 85 p. illus., map. 30½ cm. (*Secrétariat d'État aux Travaux Publics et à l'Aviation Civil... Direction de la Météorologie Nationale. Expéditions Polaires Françaises. Missions Paul-Emile Victor. Expéditions antarctiques. Résultats scientifiques.* No. S.V.] [Tables.]

LILLIE, HARRY R. *The path through penguin city.* London, Ernest Benn, 1955. 302 p. illus. maps. 22 cm. [Experiences of surgeon to whaling fleet in Antarctic. Strong advocate of more humane killing methods.]

MACHOWSKI, JACEK. *Antarktyka.* Warszawa, Wiedza Powszechna, 1953. 166 p. illus., maps. 21 cm. [History of exploration, geography, current importance and legal claims; based on Soviet sources.]

MAJOR, G. *D*-layer ionospheric echoes at Macquarie Island. *Nature*, Vol. 175, No. 4463, 1955, p. 862–63.

MANGUIN, E., *compiler.* Diatomées marines provenant de l'Ile Heard (Australian National Antarctic Research Expedition). *Revue Algologique*, N.S. T.I. Fasc. 1, 1954, p. 13–24, illus. [Systematic list of marine diatoms from Heard Island.]

MARKOWSKI, S. Cestodes of whales and dolphins from the Discovery collections. *Discovery Reports*, Vol. 27, 1955, p. 377–95, illus. [Systematic notes and discussion.]

MARSHALL, N. B. Alepisauroid fishes. *Discovery Reports*, Vol. 27, 1955, p. 303–36, illus., map. [Includes description of species found in Southern Ocean.]

NICHOLS, ROBERT L., *ed. Bedrock geology of Marguerite Bay area, Palmer Peninsula, Antarctica; compiled by Ronne Antarctic Research Expeditions under contract with Geophysics Branch, Earth Sciences Division, Contract No. N6onr280...Nonr 979 (00), prepared by R. L. Nichols.* Washington, Office of Naval Research, 1955. vi, 60 p. illus., maps. 26 cm. (Ronne Antarctic Research Expedition Technical Report No. 13). [Graham Land. Observations made March 1947 to March 1948.]

OLSEN, STEINAR. A contribution to the systematics and biology of Chaenichthyid fishes from South Georgia. *Nytt Magasin før Zoologi*, Vol. 3, 1955, p. 79–93. [Notothenid fish: *Champsocephalus gunnari* Lönnberg, *Pseudochaenichthys georgianus* Norman, and *Chaenocephalus aceratus* (Lönnberg). Material collected mostly in 1950–51.]

PAULIAN, PATRICE. Baguages d'oiseaux aux Iles Kerguélen pendant l'année 1951. *Stations Françaises de Baguage*, No. 7 (1950–51), p. 43–45. [List of birds ringed January–December 1951.]

PAULIAN, PATRICE. Pinnipèdes, cétacés, oiseaux des Iles Kerguelen et Amsterdam. Mission Kerguelen, 1951. *Mémoires de l'Institut Scientifique de Madagascar*, Série A, Tome 8, 1953, p. 111–234, plates, illus., map. [Study of Pinnipedia, Cetacea, and Aves.]

PAULIAN, PATRICE. Sur l'âge et la croissance du Léopard de mer, *Hydrurga leptonyx* (de Blainville). *Mammalia*, Tome 19, No. 2, 1955, p. 345–56, illus. [Study of growth layers of teeth of Leopard Seals from Iles de Kerguelen.]

PAULIAN, PATRICE. Sur quelques variations de la date de mise bas de l'Eléphant de mer (*Mirounga leonina*). *Mammalia*, Tome 18, No. 4, 1954, p. 373–79. [Variations in date of annual cycle of Elephant Seal in light of observations by previous visitors to Iles de Kerguelen, South Georgia, etc.]

RAND, AUSTIN L. The origin of the land birds of Tristan da Cunha. *Fieldiana: Zoology* (Chicago: Natural History Museum), Vol. 37, 1955, p. 139–66, illus., map. (Karl Patterson Schmidt anniversary volume.) [American origin of birds of Tristan and Gough Island.]

RAND, ROBERT W. The penguins of Marion Island. *Ostrich*, Vol. 26, No. 2, 1955, p. 57–69, illus. [Taxonomy, habitat preferences and moult of 4 species studied in 1951–52.]

RANKIN, NIALL. A naturalist in penguin land. *National Geographic Magazine*, Vol. 107, No. 1, 1955, p. 93–116, illus., map. [General description of animal life of South Georgia.]

RIVOLIER, JEAN. *Terre Adélie 1952. Eléments de climatologie biologique dans l'archipel de Pointe Géologie, d'après les observations des membres de la troisième expédition antarctique française et plus spécialement de J. Prévost et J. Rivolier.* Paris, Expéditions Polaires

Françaises, 1955. iv, 54 p. illus., maps. 31 cm. (*Expéditions Polaires Françaises, Missions Paul-Emile Victor. Expéditions antarctiques. Résultats scientifiques* No. S. 5.) [Study of local climate, especially at rookery of Emperor Penguins (*Aptenodytes forsteri*).]

ROBIN, GORDON DE QUETTEVILLE. Determination of the thickness of ice shelves by seismic shooting methods. *Nature*, Vol. 177, No. 4508, 1956, p. 584–86, illus. [New interpretation of seismic soundings taken in Antarctica.]

RUUD, JOHAN T. Med hvalbåt "Enern" til Sydishavet for å merke hval. *Norsk Hvalfangst-Tidende*, Årg. 42, Nr. 12, 1953, p. 681–85; Årg. 43, Nr. 1, 1954, p. 12–15; Årg. 43, Nr. 2, 1954, p. 84–88, 90; Årg. 43, Nr. 3, 1954, p. 146–51; Årg. 43, Nr. 4, 1954, p. 200–06; Årg. 43, Nr. 5, 1954, p. 276. [Reports from whale marking expedition to Antarctica in whale catcher *Enern*, 1953. In Norwegian and English.]

RUUD, JOHAN T. Vertebrates without erythrocytes and blood pigment. *Nature*, Vol. 173, No. 4410, 1954, p. 848–50. [Blood analysis of fish *Chaenocephalus* specimens from South Georgia.]

RYTTER, GRETHE. Phytoplankton and hydrography of the Pacific part of the Antarctic Ocean. *Nature*, Vol. 177, No. 4509, 1956, p. 616–17, illus. [Distribution and species collected by Norwegian Antarctic Expedition, 1947–48.]

SAPIN-JALOUSTRE, JEAN. L'identification des cétacés antarctiques à la mer. *Mammalia*, T. 17, No. 4, 1953, p. 221–59, illus., map.

SCHYTT, VALTER. Report on glaciological investigations during the Norwegian–British–Swedish Antarctic expedition, 1949–52. *Union Géodésique et Géophysique Internationale, Association Internationale d'Hydrologie Scientifique, Assemblée Générale de Rome 1954*, Tome 4, [1956], p. 236–43, illus.

SMITH, W. CAMPBELL. The volcanic rocks of the Ross Archipelago. *In: British Antarctic ("Terra Nova") Expedition, 1910, Natural History Report*, (London). *Geology*, Vol. 2, No. 1, 1954, p. 1–107, illus., map (folding at end). [Detailed petrography, petrology and chemistry of phonolitic trachytes, trachytoid phonolites, kenytes and basalts.]

SOBOLEV, L. G. Meteorologicheskiye issledovaniya v Antarktike [Meteorological investigations in the Antarctic]. *Meteorologiya i Gidrologiya* [*Meteorology and Hydrology*], 1956, No. 1, p. 60–61. [Soviet International Geophysical Year plans.]

SPARN, ENRIQUE. *Bibliografía de la geología y del clima de las islas Malvinas.* Cordoba, Argentina, Universidad Nacional, 1954. 31 p. 23 cm. [Falkland Islands. Includes brief abstracts.]

STACKPOLE, EDOUARD A. *The voyage of the Huron and the Huntress; the American sealers and the discovery of the continent of Antarctica.* Mystic, Connecticut, Marine Historical Association, Inc., 1955. 86 p. illus., maps (1 folding) 25½ cm. [Sealing in South Shetland Islands, 1820–22. Extracts from original log books of the *Huntress* (Capt. Burdick) and *Huron* (Capt. Davis) 1820–21.]

STEWART, DUNCAN. On the mineralogy of Antarctica. *American Mineralogist*, Vol. 36, Nos. 3 and 4, 1951, p. 362–67. [List of 167 minerals found in Antarctica.]

STEWART, R. H. A. Trans-Antarctic expedition, 1955–58. *Meteorological Magazine*, Vol. 85, No. 1005, 1956, p. 78–79. [Reprint from articles in *The Times*, omitting less technical material.]

STONEHOUSE, BERNARD. Bird ringing, South Georgia, 1953–55. *Ibis*, Vol. 98, No. 1, 1956, p. 137–38. [Note on number of species ringed by author during Falkland Islands Dependencies Survey.]

SYMONS, H. W. Vandrer Bryde-hvalen til Antarktis? *Norsk Hvalfangst-Tidende*, Årg. 44, Nr. 2, 1955, p. 84–87, illus. [Do Bryde Whales (*Balaenoptera brydei*) migrate to the Antarctic? In Norwegian and English.]

TATTERSALL, OLIVE S. Mysidacea. *Discovery Reports*, Vol. 28, 1955, p. 1–190, illus. [Systematic account of specimens collected by "Discovery" Investigations, mainly in south Atlantic and Southern Oceans.]

VALLETTE, YVES, *and* DUBOIS, JACQUES. *Terre Adélie 1950–1952. Constructions.* Paris, Expéditions Polaires Françaises, 1955. [ii], 126 p. illus., maps. 26½ cm. (*Expéditions Polaires Françaises. Missions Paul-Emile Victor. Expéditions antarctiques. Résultats techniques*, No. G. III.) [Detailed report on construction of French bases at Port Martin and Pointe Géologie.]

WORDIE, JAMES MANN. The International Geophysical Year : geophysical station at Coats Land, Antarctica. *Nature*, Vol. 177, No. 4509, 1956, p. 598–600, map. [Establishment of British base at Halley Bay.]

[BLISSETT, A. H.] One of Scott's men. *Antarctic News Bulletin*, No. 19. 1955, p. 15. [Obituary.]

[EXPEDITIONS : ANTARCTIC.] Navy plans to make non-stop New Zealand–Antarctic flight. *United States Naval Institute Proceedings*, Vol. 81, No. 10, 1955, p. 1173–74, map. [Programme of U.S. Antarctic expedition 1955–56 to McMurdo Sound.]

[Falkland Islands and Dependencies Meteorological Service.] *Falkland Islands and Dependencies Meteorological Service. Weather messages.* Stanley, Government Printing Office, 1953. [8 p.] 30 cm. [Details of collective synoptic messages and forecasts issued from Falkland Islands and South Georgia.]

[Falkland Islands Dependencies : Place-Names.] Royal Society Antarctic station at Halley Bay. *Nature*, Vol. 177, No. 4509, 1956, p. 606. [Name Halley Bay approved for site of Royal Society base in Coats Land for International Geophysical Year.]

[Heard and McDonald Islands : Administration.] *A bill for an act to provide for the government of Heard Island and McDonald Island.* Canberra, House of Representatives, 1953. [9] leaves. [Text of bill and debates on second reading in Senate and House of Representatives.]

[Heard and McDonald Islands : Law.] *The Commonwealth of Australia. Heard and McDonald Islands : an Act to provide for the government of Heard Island and McDonald Islands. Assented to 27th March 1953. Date of commencement, 24th April 1953. No. 7 of 1953.)* Canberra, published by Authority, 1953. 4 p. 24½ cm.

[Southern Ocean : Meteorology.] Research into weather of southern oceans. *Marine Observer*, Vol. 23, No. 160, 1953, p. 84–88, map. [Work of Royal Naval Weather Centre, Simonstown, South Africa, in constructing synoptic charts.]

[U.S.S.R. Akademiya Nauk SSSR. Sovet Po Antarkticheskim Issledovaniyam.] O sozdanii soveta po antarkticheskim issledovaniyam [On the creation of a Council for Antarctic Investigations]. *Vestnik Akademii Nauk SSSR* [*Messenger of the Academy of Sciences of the U.S.S.R.*], 1955, No. 11, p. 111. [Established 1955 within Academy, under chairmanship of D. I. Shcherbakov.]

[Whale Marking : Antarctic.] Hvalmerking utført av "Slava"-ekspedisjonen. *Norsk Hvalfangst-Tidende*, Årg. 43, Nr. 10, 1954, p. 591–92. [Whale marking by Russian *Slava* expedition in 1952–53 and 1953–54 seasons. In Norwegian and English.]

[Whaling Companies.] Compañía Argentina de Pesca S. A. *Norsk Hvalfangst-Tidende*, Årg. 43, Nr. 10, 1954, p. 553–56, 559–62, 656–76, illus. [Historical notes on whaling company started in 1904, with personal data on managers, etc. In Norwegian and English.]

[Whaling Industry : South Pacific.] Hvalfangst ved den chilenske kyst. *Norsk Hvalfangst-Tidende*, Arg. 43, Nr. 5, 1954, p. 267–72, illus. [Whaling off Chile. In Norwegian and English.]

[Whaling Regulation : Antarctic.] Hvalbåtbegrensning. *Norsk Hvalfangst-Tidende*, Årg. 44, Nr. 3, 1955, p. 144–45. [Restriction of numbers of whale catchers, 1954–55 Antarctic season. In Norwegian and English.]

[Whaling Regulation : South Pacific Ocean.] Fangst og fiske i det sørlige Stillehav. *Norsk Hvalfangst-Tidende*, Årg. 43, Nr. 12, 1954, p. 689–706. [Regulation of whaling in South Pacific and 200 mile territorial water limit claim of Chile, Peru, Ecuador. In Norwegian and English.]

GENERAL

Ash, C. E. Finnhvalere i 1954/55: spekktykkelsen og kokerieffektiviteten. *Norsk Hvalfangst-Tidende*, Årg. 44, Nr. 5, 1955, p. 264–75, illus. [Fin Whales (*Balaenoptera physalus*) captured in 1954–55: blubber thickness and factory efficiency. In Norwegian and English.]

Atkinson, P. C. The use of the helicopter for topographical mapping surveys. *Canadian Surveyor*, Vol. 11, No. 6, 1953, p. 5–13, illus. [As used by Canadian National Topographic Survey. Critical and informative review.]

Beastall, D., *and* Winyard, A. *A frost point hygrometer for supersonic wind tunnels.* London, Her Majesty's Stationery Office, 1953. 9 p. illus. 32½ cm. 1*s*. 6*d*. (A.R.C. Technical Report, C.P. No. 106.)

Bonnlander, B. H., *and* Belmont, Arthur D. *Bibliography on polar atmospheric circulation.* Montreal, Arctic Meteorology Research Group, McGill University, 1955. 88 leaves. (Appendix to Status Report No. 5. Prepared under Contract AF 19 (604)–1141.)

Brown, A. W. A., *and* Morrison, P. E. Studies on portable jet aerosol generators for control of adult mosquitoes. *Mosquito News*, Vol. 15, No. 1, 1955, 12 p. illus. [Two machines tested.]

Dobrovol'skiy, A. D. Yubiley Nikolaya Nikolayevicha Zubova [Jubilee of Nikolay Nikolayevich Zubov]. *Meteorologiya i Gidrologiya* [*Meteorology and Hydrology*], No. 5, 1955, p. 67–68, illus. [Biographical sketch on 70th birthday of Soviet oceanographer and sea ice specialist.]

Downey, B.R. Paper snow fence installations (Michigan). *Highway Research Abstracts*, Vol. 23, No. 6, 1953, p. 40–48, illus., map. [Results of experiments using paper strips in place of wood.]

Gal'perin, M. I., *and others*. Razrabotka merzlogo grunta [Excavation of frozen ground], by M. I. Gal'perin, Ye. A. Torgonenko and A. P. Degtyarev. *Stroitel'naya Promyshlennost'* [*Building Industry*], 1954, No. 10, p. 14–17, illus. [Design for cutter attached to mechanical excavator. English translation in SIPRE (U.S. Army Corps of Engineers), Translation No. 53, 1955.]

Garavel, L. Éléments pour l'étude des projets de travaux contre les avalanches. *Annales de l'École Nationale des Eaux et Forêts et de la Station de Recherches et Expériences*, Tome 14, Fasc. 2, 1955, p. 223–60, illus. [Avalanche defences and avalanche prevention measures discussed in detail. English and German summaries.]

Gillham, E. J., *and others*. A study of transparent, highly conducting gold films, by E. J. Gillham, J. S. Preston and Betty E. Williams. *Philosophical Magazine*, Ser. 7, Vol. 46, No. 381, 1955, p. 1051–68, illus. [Thin gold films on a bismuth oxide substrate have a film resistance of 3·5 ohms per square, and white light transmission of up to 82 %, and are therefore suitable as a coating for de-icing windows by direct electrical heating.]

Hunten, D. M. A rapid-scanning auroral spectrometer. *Canadian Journal of Physics*, Vol. 31, No. 5, 1953, p. 681–90, illus. [Description of instrument capable of obtaining auroral spectrum in 10 seconds with 10 Å resolution.]

Johnson, A. W. *Frost action in roads and airfields: a review of the literature 1765–1951.* Washington, Highway Research Board, 1952. xii, 287 p. illus. [Literature summarized chronologically.]

Kosiba, Aleksander. O nowej klasfikacji śniegu atmosferycznego [On a new classification of atmospheric snow and of snow cover]. *Przeglad Meteorologiczny i Hydrologiczny* [*Review of Meteorology and Hydrology*], Rocznik 7, Zeszyt 1–2, 1954, p. 19–30, illus. [Report of the new classification of Schaefer, Klein and de Quervain, and a plea for an expansion to cover avalanches, firn, snow in polar regions, polar dust and cryoconites and, eventually, ice. English summary p. 29–30.]

Larsen, Ole Aanderud, *jr*. Opparbeiding av hval sett fra et invensterings [sic]-synspunkt. *Norsk Hvalfangst-Tidende*, Årg. 43, No. 8, 1954, p. 445–49. [Rendering plants on factory ships from point of view of investment. Comments on Arne B. Holt's article in *Norsk Hvalfangst-Tidende*, Årg. 43, No. 7, 1954. In Norwegian and English.]

Lorant, Michael. New non-magnetic sky compass for polar regions. *United States Naval Institute Proceedings*, Vol. 81, No. 8, 1955, p. 947–48. ["Sky compass." Developed by U.S. National Bureau of Standards.]

McFarlane, P. B. Glacial shore-lines. *Nature*, Vol. 176, No. 4474, 1955, p. 213–14, illus. [Calculation of position of shore lines round the globe with and without polar ice caps, taking into account both eustasy and perfect isostasy.]

Mackworth, N. H. Cold acclimatization and finger numbness. *Proceedings of the Royal Society*, B, Vol. 143, 1955, 392–407. [Field and cold-room experiments demonstrating that people in cold environments show acclimatization.]

Makeyev, P. S. Po povodu kritiki antiglyatsializma [Concerning criticism of antiglacialism]. *Izvestiya Akademii Nauk SSSR. Seriya Geograficheskaya* [*News of the Academy of Sciences of the U.S.S.R. Geographical Series*], 1955, No. 6, p. 69–75. [Author defends his denial of existence of quaternary ice sheets against attack by K. K. Markov.]

Mayaud, Pierre-Noël. Sur la forme de la variation Sa-Sq du champ magnétique dans les régions polaires. *Annales de Géophysique*, Tome 10, No. 1, 1954, p. 89–92, illus. (*Rapports scientifiques des Expéditions Polaires Françaises*, No. S.4.2.) [Comparison of readings at 3 antarctic and 7 arctic stations.]

Munk, W. H. Polar wandering : a marathon of errors. *Nature*, Vol. 177, No. 4508, 1956, p. 551–54. [Controversial theories during last 70 years.]

Nowosielski-Slepowron, B. J. A., *and* Peacock, A. D. Chromosome numbers in the Blue, Fin and Sperm Whales. *Proceedings of the Royal Society of Edinburgh, Section B* (*Biology*), Vol. 65, Pt. 3 (No. 23), 1955, p. 358–68, illus. [Observations in 1948–50.]

Odell, Nowell Ewart. So-called 'glacier-worms' in New Zealand. *Nature*, Vol. 177, No. 4507, 1956, p. 534. [Specimens identified as species of *Chironomidae*, not *Oligochaeta*.]

Orvig, Svenn. "Atlas der Eisverhaltnisse des Nordatlantischen Ozeans und Ubersichtskarten der Eisverhaltnisse des Nord- und Sudpolargebietes". *Arctic*, Vol. 8, No. 2, 1955, p. 128–30. [Critical review of German ice atlas, published 1950 by Deutsches Hydrographisches Institut.]

Piotrovich, V. V. Obrazovaniye vnutrivodnogo l'da i nekotoryye novyye perspektivy bor'by s nim [Formation of frazil ice and some new ways of combating this]. *Meteorologiya i Gidrologiya* [*Meteorology and Hydrology*], 1956, No. 3, p. 21–25. [Suggested ways of preventing formation of frazil crystals in hydro-electric systems.]

Purves, P. E. The wax plug in the external auditory meatus of the Mysticeti. *Discovery Reports*, Vol. 27, 1955, p. 293–302, 5 plates. [Structure and composition of specimens from rorqual (*Balaenoptera physalus*). Promising method of age determination.]

RIKHTER, G. D., *ed.* *Voprosy izycheniya snega i ispol'zovaniya yego v narodnom khozyaystve* [*Questions of snow study and its use in the national economy*]. Moscow, Izdatel'stvo Akademii Nauk SSSR [Publishing House of the Academy of Sciences of the U.S.S.R.], 1955. 176 p. illus. 22 cm. [Collected papers on physical properties of snow cover; its influence on soils, its behaviour in fields and woods.]

RITSON, E. L. E. Survival at sea. *United States Naval Institute Proceedings*, Vol. 79, No. 10, 1953, p. 1057–63. [Includes table of time of unconsciousness and death of humans when immersed in water of various temperatures.]

ROBINS, J. P. Ovulation and pregnancy corpora lutea in the ovaries of the Humpback Whale. *Nature*, Vol. 173, No. 4396, 1954, p. 201–03, illus. [Based on observations of *Megaptera nodosa* at Tangalooma, Queensland, 1952–53.]

SARSON, P. B. Rime at Holme Moss. *Meteorological Magazine*, Vol. 85, No. 1004, 1956, p. 57–58, 4 plates (following p. 48). [Photographs of heavy rime on transmitting mast with discussion of meteorological conditions, 17 March 1954.]

SHERGOLD, F. A. The effect of freezing and thawing on the properties of roadmaking aggregates. *Roads and Road Construction*, Vol. 32, 381, 1954, p. 274–76. [Experiments with road surfacings and bases to determine action of frost upon them.]

SIEMS, MARGARET V., *and others*. Electrocardiographic observations in experimental hypothermia in dogs. By Margaret V. Siems, Steven M. Horvath, G. B. Spurr, B. K. Hutt and L. E. January. *American Journal of Physiology*, Vol. 181, No. 2, 1955, p. 325–29, illus. [Observations on 28 dogs at temperatures below $-10°$ C.]

SLEPTSOV, M. M. Osobennosti razvitiya kitoobraznykh na rannikh embrioal'nykh stadiyakh [Features in the development of whales in early embryonic stages]. *Trudy Instituta Okeanologii* [*Transactions of the Institute of Oceanography*], Tom 18, 1955, p. 48–59, illus. [Based on author's work on Black Sea dolphins (*Delphinus delphis ponticus*), 1935–52.]

SLIJPER, E. J. Den hollandske delegasjons memorandum om reduksjon av de 16.000 blåhvalenheter. *Norsk Hvalfangst-tidende*, Årg. 42, Nr. 10, 1953, p. 560–64. [Memorandum of Dutch delegate to International Whaling Commission's scientific subcommittee (1953) on reduction of the 16,000 Blue whale units. In Norwegian and English.]

SLIJPER, E. J. Om betydningen av å måle spekklagets tykkelse på hvalen. *Norsk Hvalfangst-Tidende*, Årg. 43, Nr. 9, 1954, p. 510–16, illus. [Importance of measuring blubber thickness in whales: relation to oil output. In Norwegian and English.]

SMITH, PHIL. D. *Knots for mountaineering, camping, climbing, utility, rescue, etc.* Twentynine Palms, California, Phil. D. Smith, [©1953]. 21 p. illus. 23 cm. [Reviewed in *Appalachia*, New Series, Vol. 20, No. 7, 1954, p. 131–32.]

SOKOLOV, V. YE. Struktura kozhnogo pokrova nekotorykh kitoobraznykh [Skin structure of some cetaceans]. *Byulleten' Moskovskogo Obshchestva Ispytateley Prirody. Novaya Seriya. Otdel Biologicheskiy* [*Bulletin of the Moscow Society of Naturalists. New Series. Biological Section*], Tom 60, No. 6, 1955, p. 45–60, illus. [Skin thickness measurements of several species compared for evidence of adaptation to water habitat.]

SOKOLOV, A. P. Zamor ryb podo l'dom i puti bor'by s nim [Death of fish under ice and ways of combating this]. *Priroda* [*Nature*], 1955, No. 12, p. 98–100. [Measures to prevent fish in reservoir dying from lack of oxygen.]

TANIFUJI, SHOZO, *and* OGAWA, TETSUO. Experimental researches on snow drift control, 1. *Journal of Research of the Public Works Research Institute*, [Ministry of Construction, Japan], Vol. 1, Research Paper 12, 1954, p. 129–42. [Mathematical analysis and experiments with models to determine basic principles of snow drifting with various types of fence and other factors.]

TEMPLETON, J. B. Arctic application of the heat pump. *Engineering Journal*, Vol. 37, No. 12, 1954, p. 1607–09. [Modification of standard refrigerating unit driven by diesel engine.]

THOMPSON, THOMAS G., *and* NELSON, KURT H. Desalting water by freezing. *Refrigeration Engineering*, July 1954, 6 p. (Reprint). [Experiments show this method requires less energy than distillation.]

TOMILIN, A. G. O povedenii i zvukovoy signalizatsii kitoobraznykh [Behaviour and sound signals of whales]. *Trudy Instituta Okeanologii* [*Transactions of the Institute of Oceanography*], Tom 18, 1955, p. 28–47, illus. [Instincts, reactions, sense of touch, sight and hearing.]

TRESSLER, WILLIS L. Arctic and Antarctic. *United States Naval Institute Proceedings*, Vol. 81, No. 11, 1955, p. 1216–19, illus. [Comparison, mainly of sea ice conditions, based on author's voyages aboard U.S.S. *Burton Island*, 1954, to Canadian Arctic islands, and aboard U.S.S. *Atka* to Ross and Weddell Seas, 1954–55.]

TWINN, C. R., *and* PETERSON, D. G. *Control of black flies in Canada.* Ottawa, Canada Department of Agriculture, Entomology Division, Science Service, 1955. 9 p. illus. (Publication 940.) [Methods of controlling larvae of Simuliidae and adults; personal protection.]

VOWINCKEL, E. Verdien av de meteorologiske observasjoner fra hvalkokeriene. *Norsk Hvalfangst-Tidende*, Årg. 43, Nr. 2, 1954, p. 73–77. [Value of meteorological observations from whaling factory ships. In Norwegian and English.]

WILSON, J. WARREN. The influence of 'midnight sun' conditions on certain diurnal rhythms in *Oxyria digyna*. *Journal of Ecology*, Vol. 42, No. 1, 1954, pp. 81–94, illus. [Variation in stomatal aperture and carbohydrate concentration in leaves investigated.]

ZAKHAROV, V. P., *and* CHIZHOV, O. P. O bor'be s ledyanymi zatorami na Syr-Dar'ye putem vzryvnykh rabot [Dealing with ice jams on the Syr-Dar'ya with explosives]. *Meteorologiya i Gidrologiya* [*Meteorology and Hydrology*], 1956, No. 1, p. 44–45. [Recommended methods.]

[ACCLIMATIZATION.] Resistance and acclimatizing to cold. *Occupational Health Review* (Ottawa), Vol. 5, No. 2, 1954, p. 25–26. [Experiments made on animals by Dr L. P. Dugal at Laval University, Quebec: cold resistance compared for different diets; importance of ascorbic acid.]

[CATERING FOR EXPEDITIONS.] Provisioning expeditions in the field. *Nature*, Vol. 172, No. 4387, 1953, p. 974–75. [Résumé of symposium held by the Nutrition Society and Royal Geographical Society, 26 October, 1953.]

[CETACEA.] Observations of Whales from ships: report on the first year's observations. *Marine Observer*, Vol. 23, No. 162, 1953, p. 228. [Analysis of reports from British Merchant ships.]

[EXPÉDITIONS POLAIRES FRANÇAISES.] *Expéditions Polaires Françaises. Missions Paul-Emile Victor. Terre Adélie, Groenland, 1947–1955. Rapport d'activités.* Paris, Arthaud, 1956. 151 p. illus., maps. 27 cm. [Review of activities of this organization in Iceland, Greenland, Terre Adélie.]

[GLACIOLOGY : BIBLIOGRAPHY.] Bibliography on snow, ice and permafrost with abstracts. *S*[*now*,] *I*[*ce*] *and P*[*ermafrost*] *R*[*esearch*] *E*[*stablishment*] (U. S. Army, Corps of Engineers) Report 12, Vol. 7, 1955, iv, 270 p.

[ICE : FRICTION.] *Friction on snow and ice.* Minnesota Institute of Technology, University of Minnesota, 1955. [395] leaves, illus. 27½ cm. (Prepared for Snow, Ice and Permafrost Research Establishment, Corps of Engineers, U.S. Army.) [Examination of mechanism causing frictional resistance in snow and ice.]

[ICEBREAKERS.] Diesel-engined Soviet icebreakers. *Motor Ship*, Vol. 35, No. 419, 1955, p. 503, illus. [Particulars of *Kapitan Belousov* class (10,500 h.p.), and of unnamed class [22,000 h.p.), now in construction at Helsinki.]

[ICEBREAKERS.] The "Thule"; 6000 b.h.p. Diesel-electric ice-breaker built for service in the Baltic. *Motor Ship*, Vol. 34, No. 406, 1954, p. 464–65, illus. [Description of ship completed in Sweden in 1953.]

[ICING OF AIRCRAFT.] *Meteorological aspects of aircraft icing.* Geneva, World Meteorological Organization, 1954. 18 p. 27½ cm. (Technical Note No. 3.) [Summary of recently published papers.]

[INTERNATIONAL GEOPHYSICAL YEAR.] *Proposed United States program for the International Geophysical Year, 1957–58.* Washington, D.C., United States National Committee for the International Geophysical Year, National Academy of Sciences—National Research Council, 1955. 108 p. maps. 27½ cm.

[SHIPS.] Ice strengthened tanker. *United States Naval Institute Proceedings*, Vol. 81, No. 11, 1955, p. 1282–83, illus. [Details and side elevation of arctic transport tanker T—AOG—81 class, U.S. Navy.]

[SHIPS : RADIO.] U.S.S. *Glacier* to use antenna kept in air by balloons. *United States Naval Institute Proceedings*, Vol. 81, No. 10, 1955, p. 1175. [To provide radio communication of 1,500 miles under difficult polar conditions.]

[SLEDGE RUNNERS.] 'Bakelite' laminated for sledge runners. *Bakelite Progress*, Spring 1955, p. 4–5, illus. [Use of laminated Bakelite for sledge runners.]

[WHALING COMPANIES.] Aksjeselskapet Kosmos 25 år. *Norsk Hvalfangst-Tidende*, Årg. 42, Nr. 11, 1953, p. 630–40, illus. [History of first 25 years of Norwegian whaling company Hvalfangerselskapet Kosmos A/S. In Norwegian and English.]

[WHALING CONFERENCES.] Den Internasjonale Hvalfangstkommisjon av 2. desember 1946. *Norsk Hvalfangst-Tidende*, Årg. 42, Nr. 11, 1953, p. 641–51. [New regulations agreed on at 1953 meeting of International Whaling Commission. In Norwegian and English.]

[WHALING CONFERENCES.] Den Internasjonale Hvalfangstkonvensjon av 1946: 5. møte i Kommisjonen. *Norsk Hvalfangst-Tidende*, Årg. 42, Nr. 10, 1953, p. 549–560, illus. [Proceedings at 5th meeting of International Whaling Commission, London 1953. In Norwegian and English.]

[WHALING CONFERENCES.] Den Internasjonale Hvalfangstkonvensjon av 1946: 6. møte i Kommisjonen. *Norsk Hvalfangst-Tidende*, Årg. 44, Nr. 1, 1955, p. 1–19, illus. [Sixth meeting of International Whaling Commission, in Tokyo, 1954. In Norwegian and English.]

[WHALING CONFERENCES.] Den Internasjonale Hvalfangstkommisjon. *Norsk Hvalfangst-Tidende*, Årg. 43, Nr. 8, 1954, p. 449–50. [Press notice published by International Whaling Commission after 1954 meeting in Tokyo. In Norwegian and English.]

[WHALING CONFERENCES.] Den Internasjonale Hvalfangstkonvensjon. *Norsk Hvalfangst-Tidende*, Årg. 44, Nr. 3, 1955, p. 147–48. [Protest by various contracting governments against resolutions of 1954 meeting of International Whaling Commission. In Norwegian and English.]

ERRATA

The *Polar Record*, No. 48, July 1954

Page 172, line 29. *For* Golbourne *read* Golborne

The *Polar Record*, No. 52, January 1956

Page 26, line 11. *Below* J. J. Donner *add* J. A. B. Denton, Engineer

Page 57, line 9. *For* 8 men *read* 9 men

Page 57, line 55. *For* 2 men wintered in 1947 *read* Occupied temporarily by 2 men

Page 83, line 23. *For* Crossfjorden *read* Krossfjorden

Page 85, line 33. *For* Geographical *read* Geographic

Page 86, line 11. *For* Leid *read* Lied

The *Polar Record*, No. 53, May 1956.

Page 175, line 38. *For* Balanus *read* Balaenoptera

NOTICES

The *Polar Record* is published in January, May and September each year. Contributions, also books and papers for listing in the bibliography of "Recent Polar Literature", should be addressed to the Editor, Scott Polar Research Institute, Lensfield Road, Cambridge, England.

Every effort is made to enable authors of articles to receive proofs, which they are requested to return without delay. Proofs of notes are not normally submitted to authors, except when especially requested.

Twenty-five reprints of articles are supplied free to authors; additional copies, which are provided at cost price, should whenever possible be requested on submitting the contribution. Reprints of notes are not normally supplied.

Correspondence arising out of notes and articles is welcomed.

The Scott Polar Research Institute is a signatory of the Royal Society's "Declaration on fair dealing in regard to copying from scientific periodicals". Details of the Declaration may be obtained upon application from the offices of the Royal Society, Burlington House, London, W. 1.

The cover of the journal is from a photograph by H. G. Ponting, taken during the British Antarctic Expedition, 1910–13.

PUBLICATIONS FOR SALE AT THE SCOTT POLAR RESEARCH INSTITUTE

Scientific Reports of the Terra Nova expedition, 1910–13

Reports dealing with meteorology, terrestrial magnetism, gravity determination, aurora observations, physiography and miscellaneous data are still available. For a detailed list, and prices, see the inside back cover of the *Polar Record*, No. 44.

Back issues of the Polar Record

A few sets of the *Polar Record*, Volumes 1–5 (Nos. 1–40), including indexes, are available, price £60 at the discretion of the Committee of Management; also the following separate issues at seven shillings and sixpence each:

Nos. 1, 2, 3, 4, 17, 19, 31, 32, 39 onwards.

Nos. 33/34, 35/36, and 37/38. These are double numbers and are fifteen shillings each.

Indexes for Volume 1 (Nos. 1–8), Volume 2 (Nos. 9–16) and Volume 3 (Nos. 17–24) are five shillings each, and the index for Volume 4 (Nos. 25–32) is ten shillings.

Reprints of "Recent Polar Literature", from Nos. 37/38 onwards, are two shillings and sixpence for two reprints for each issue.

Reprints of "Illustrated Ice Glossary", by Terence Armstrong and Brian Roberts, from Volume 8, No. 52, 1956, are five shillings.

An illustrated descriptive pamphlet entitled *The Scott Polar Research Institute* is one shilling and sixpence.

Prices are subject to alteration without notice.

"FRIENDS OF THE POLAR INSTITUTE"

This association was established in March 1946 with two objects in view: first to provide a means whereby those interested in the promotion of polar exploration and research might assist the Scott Polar Research Institute, and secondly to keep members in touch both with the Institute and with present polar activities. Members receive the Annual Report of the Committee of Management, which describes the work and progress of the Institute, and the Annual Report of the "Friends of the Polar Institute".

The minimum annual subscription is one guinea. British taxpayers who are able to subscribe by covenanted agreement for a period of seven years will be giving additional assistance to the Institute. "Friends" are asked to subscribe separately to the journal of the Institute, the *Polar Record.*

The "Friends" have been the means of giving very valuable help to various sides of the Institute's work. Subscriptions are used principally for making accessions to the Museum and Library, for providing furniture and equipment, and for special needs which cannot be met from other sources.

SUBSCRIPTIONS TO THE *POLAR RECORD*

The *Polar Record* may be obtained direct from the Scott Polar Research Institute, Lensfield Road, Cambridge, England, or through any bookseller. The subscription is twenty-two shillings and sixpence a year, or seven shillings and sixpence a single copy, post free.

PRINTED IN GREAT BRITAIN AT THE UNIVERSITY PRESS, CAMBRIDGE
(BROOKE CRUTCHLEY, UNIVERSITY PRINTER)